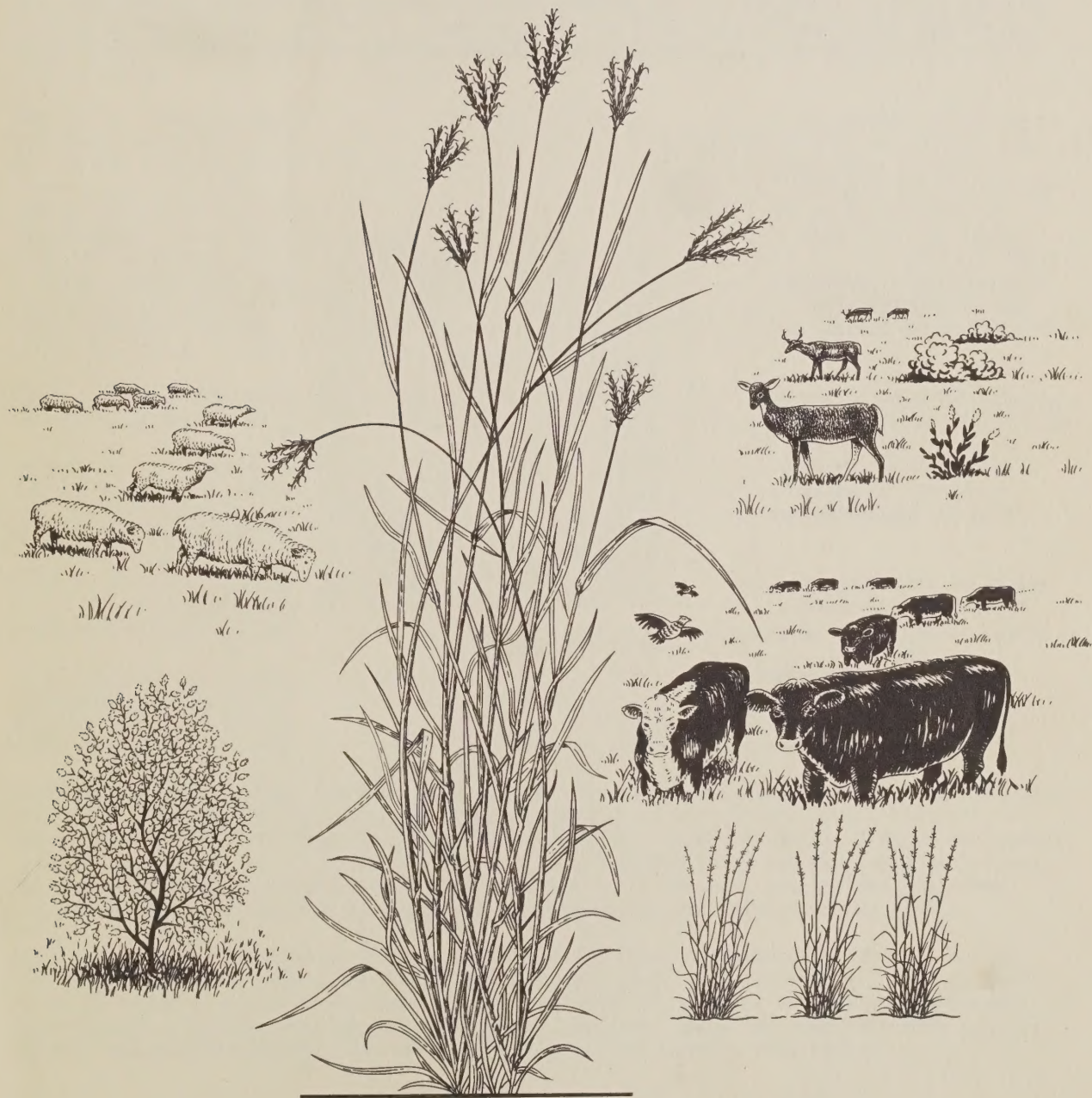


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National Handbook for **RANGE** AND RELATED GRAZING LANDS



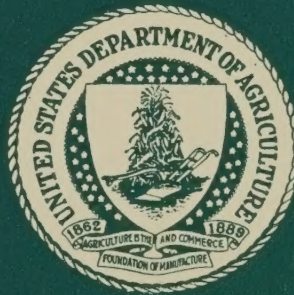
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FOREWORD

The Soil Conservation Service has been a major influence in getting modern range conservation applied on privately controlled rangeland. This has been an evolutionary process which has progressed steadily for more than thirty years.

This handbook is the product of that experience. It brings together an up-to-date statement of sound principles and presents proved techniques for their application.

Creation of locally controlled soil and water conservation districts set the stage for real conservation progress on privately controlled rangelands. They gave ranchers and others the organization through which to assess their land use and conservation problems, establish objectives, and work towards accomplishing them.

The memorandums of understanding between the Department of Agriculture and districts, and the supplemental memorandums of understanding between SCS and districts, brought the professional rangeman and the rancher together. This professional alliance--the rancher and range conservationist working together on the land--has been the most significant part of the evolution.

The art of range management required special adaptations to make it acceptable to private rangeland users and practical in their daily operations. Experience soon showed the need for better methods of inventorying rangeland, methods which evaluated soils, climate, vegetation, wildlife, and livestock and their inter-relationships. Methods which produced information about all rangeland resources were needed so the rancher could consider all practical alternatives and make intelligent decisions. Out of this need grew the range site and condition concept and criteria that were developed by SCS. As more precise soil, climate, vegetation, and other ecological information has become available, these concepts have grown and gained in acceptance. The combined efforts of range conservationists and soil scientists in SCS, of many experiment stations and universities, and of other agencies have contributed to this development.

Other technological developments that have contributed to this progress include the finding and development of new grasses, other plants, and conservation practices to meet local needs.

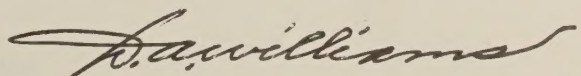
Procedures for determining total annual yield of vegetation by soil taxonomic units now provide a base of information for considering all opportunities for rangeland use and development. SCS is now preparing to use electronic data processing techniques to make more efficient use of this information.

Consideration of costs and probable returns from alternative uses and treatments of rangeland has contributed to progress in range conservation. There is increasing interest in cost-return information by cooperators who are developing and applying conservation plans.

From the traditional base of the western range, SCS has obtained acceptance of range management principles and adapted their application in other parts of the country. Men educated in range management have been added to SCS staffs in the South, Midwest, and Northeast Regions. Conservation programs have been strengthened by these actions.

Significant, too, are our improved arrangements for working with the Bureau of Land Management when assisting ranchers who use intermingled public and private land. Likewise, our work with the Forest Service on grazable woodlands, the Bureau of Indian Affairs on conservation programs on Indian Lands, the Farmers Home Administration and Grazing Associations, the Bureau of Sports Fisheries and Wildlife on wildlife refuges, and the National Park Service on big game habitats has improved the quality of our service to the public.

This handbook is the official SCS guide for work on range and related grazing land. It will also serve as a base of guiding principles for range assistance in our foreign work, which is becoming increasingly heavy. It is a symbol of progress and healthy evolution. As we continue to work with ranchers and other rangeland users and cooperate with universities, experiment stations, and other agencies, we can make it even better.



NATIONAL HANDBOOK
FOR
RANGE
AND RELATED GRAZING LANDS

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1.00 AUTHORITY, OBJECTIVES, AND POLICIES FOR SCS RANGE WORK

1.10 Authority

The Soil Conservation Act of 1935 provides authority for the conservation program of the Soil Conservation Service on range and related grazing lands. This law declares it to be the policy of Congress to preserve the natural resources of the grazing land of the nation. It authorizes SCS to carry out conservation measures on this land as well as to assist its owners to carry on conservation activities. (Public Law No. 46, 74th Congress).

1.11 Specific SCS responsibility

SCS has specific responsibility on grazing lands, as limited by later directives, to furnish technical assistance to landowners and operators which enables them to develop and apply conservation programs on the privately controlled lands in their operating units. (Amendment No. 4, Title 9, Administrative Regulations, May 17, 1954, and Comptroller General's Opinion of October 1, 1953.)

1.20 Objectives

The broad objectives of the Department and SCS to bring about the "use of each acre within its capability and the treatment of each acre in accordance with its need for protection and improvement" applies to rangeland, grazable woodland, and native pasture as well as to all other agricultural land. More specifically, the conservation objectives of SCS on rangeland and related grazing land are to assist landowners and operators to:

- 1.21 Appraise the productive potential of their land and its suitability for forage, livestock and wildlife production and related uses from the standpoint of climate, topography, soil, plants and economic factors.
- 1.22 Develop a sound and economic conservation plan for their operating units based on a scientific inventory of soil, water, and forage resources.
- 1.23 Reduce soil and water losses and aid in restoring and improving forage resources by applying sound conservation measures.
- 1.24 Maintain a permanent, stable, and productive livestock industry with as complete utilization of the forage crop as is consistent with protection of the soil resource and permanence of forage production.
- 1.25 Consider multiple-use alternatives which are compatible with grazing use and have potential for bolstering income.

1.30 Policies

- 1.31 Technical guides. Technical guides for rangeland and related grazing land are to be developed and kept current. State conservationists, assisted by range conservationists and other appropriate SCS personnel, are to develop these guides. They should contain technical standards necessary to: (1) Evaluate capability of rangeland by identifying and describing range sites, (2) determine condition of rangeland in relation to its potential productivity, (3) develop sound standards and specifications for conservation practices for rangeland and assist in developing specifications for practices for grazable woodland and native pastures, and (4) help users select and apply the conservation practices needed to improve and conserve the soil, water, plant and wildlife resources of their lands for all applicable uses.

1.32 Capability determination of rangeland and related grazing land. On land planned for rangeland use, range sites are to be used as capability units in planning conservation operations with range users. On grazable woodland, capability to produce vegetation for forage may be interpreted through woodland suitability groups. On native pasture, capability to produce vegetation for forage is to be based on an appropriate grouping of soils. (See Plant Sciences Memorandum-6, Re: Native Pasture.) If appropriate interpretive soil groupings have not been developed, soil taxonomic units may be used.

1.33 Technical assistance

1.331 Work load analyses in range areas. Range conservationists assist area and work unit conservationists in analyzing work load and in setting realistic goals for work in areas to which they are assigned.

1.332 Assistance to users. To attain the conservation objective of individual livestock units, SCS assists in developing and applying conservation plans based on a scientific inventory of soil, water, plant and wildlife resources. The objective is to help all rangeland users to become conservationists. If possible, group planning and application is used as a supplement to working with individual rangeland users.

1.333 Working with leaders. In assisting individual operators, SCS works through leaders in soil conservation districts, livestock organizations and other local organizations. This often insures action in range conservation and effective use of SCS' and landowners' resources.

1.334 Followup assistance. Followup assistance is essential to insure satisfactory progress in applying conservation plans. This is particularly true on management practices. After a conservation plan is developed, area and work unit conservationists should see that adequate time is scheduled to work with an operator in carrying out those practices on which additional technical assistance is needed.

1.335 Guidance on stocking rates. SCS does not establish grazing capacities. Neither does it require an agreed on stocking rate in conservation plans. It does have responsibility to (1) provide cooperators with information on stocking rates applicable to different range site and forage conditions and (2) point out to cooperators how such information enables them to make sound decisions on grazing use. Therefore, SCS conservationists need to be well versed on stocking rates applicable to the various range sites and condition classes. SCS encourages cooperators to plan longtime operations based on conservative use of forage production, and to make annual or seasonal adjustments in grazing use as necessary in accordance with the forage produced and the condition of the range.

1.336 SCS assistance on Federal land. SCS may, under specific circumstances, furnish technical assistance on Federal grazing land. Such assistance must be covered by agreements with agencies involved and with the respective soil and water conservation district. (Comptroller General's opinion of October 1, 1953, and INTERAGENCY MEMORANDUM-7).

SCS may furnish consultive assistance to an agency administratively responsible for Federal grazing land on request by the agency. (Section 4.23, Consultive Assistance, National Handbook for Conservation Planning).

1.337 Grazing management in grazable woodland and other range-related land. Range conservationists work with woodland conservationists, biologists, agronomists and soil scientists to develop criteria for sound grazing management on grazable woodland, native pasture, and grazed wildlife areas.

1.34 Staffing of range conservationists

1.341 Work units. Work unit conservationists who serve soil conservation districts that are predominantly range, grazable woodland, or native pasture should be range-educated. For districts of mixed farming and ranching, work unit conservationists without range education should be supported by range conservationists if there is a heavy workload. If a work unit conservationist is range-educated, his staff should include a soil conservationist and other needed personnel so that cultivated areas also receive adequate attention. If the workload in several districts requires the services of a range conservationist, but does not justify a full-time position in any one work unit, establishing a position of range conservationist to serve several work units is the solution. Such range conservationists may be headquartered at a work unit or area office, depending on circumstances. (See PLANT SCIENCES MEMORANDUM-2).

1.342 Recruiting range conservationists. Range conservationists and soil conservationists with range education are to be recruited on the basis of current SCS and Civil Service requirements. Special emphasis should be placed on the established policy of budgeting for, recruiting, and training quality student trainees. Employees receive group and individual on-the-job training. They have opportunities for further educational work, rotative assignments, inter-State transfers and self-improvement. They have opportunities for advancement as higher-grade positions are established or become vacant. For GS-11 range conservationist vacancies, a State conservationist is to consult with the regional range conservationist serving his State in locating suitable candidates.

1.343 Training. Range conservationists, in addition to assisting rangeland users and livestock farmers in planning and applying sound conservation programs, are becoming more and more involved in other suitable uses of range and related grazing lands. This point is illustrated by added responsibilities in wildlife, outdoor recreation, beautifying America, providing assistance to foreign countries, providing assistance in RC&D Projects, watershed land treatment, broad area planning and the like. Range conservationists need training in these broadened SCS activities as well as in range conservation.

1.3431 Initial inservice training. While new range conservationists work at training locations, area and work unit conservationists determine and record their training needs. Range conservationists (GS-9 and above) help area and work unit conservationists to determine these needs. If range conservationists have common needs, group training is arranged. Other needs are met by individual on-the-job training and self-improvement. Line officers, assisted by GS-9 and above range conservationists, must follow up to make sure that self-improvement training is carried out. Early assignment of responsibility and work to new employees is an important part of their training and development.

1.3432 Career development. Range conservationists in grades GS-9 and above who have high potential for advancement in technical or administrative fields should be given every opportunity for further development. This should include: (1) short details to other States to receive on-the-job training from range conservationists outstanding in some phase of range work, (2) advanced study at a college or university, and (3) opportunities for broadened experience in line positions.

State conservationists are to arrange for individual appraisal of the training needs of all their range conservationists, new and experienced, and for group, on-the-job, and self-improvement training programs.

The broadest possible background of training and experience of key personnel is essential to keep the conservation program of SCS strong. Under the present organization of SCS transferring range conservationists in grades GS-9 and above between States is highly important as a part of training for positions of greater responsibility. A State conservationist who has to fill a GS-11 job may find the number and quality of candidates greatly enlarged if he looks beyond the boundaries of his State. Exchange and promotion of personnel across State lines is one of the ways to maintain a national program of assisting soil conservation districts in soil, water, and plant conservation.

- 1.35 Technical information. Range conservationists are responsible for the technical excellence of SCS range work. They are further responsible for communicating practical and technical information on grassland conservation to those outside SCS.

1.351 Development and dissemination. Range conservationists should take a leading part in formulating the technical standards needed to attain SCS objectives and in having them made a part of approved State procedures. They assist in having these standards printed in technical guides, job sheets, technical notes, and other instructional materials. Standards should be prepared as simply and clearly as possible. Range conservationists should encourage SCS technicians in district, watershed and other activities to use these standards. Regional range conservationists should assist field technicians to develop suitable technical information and may coordinate reproduction or purchase of printed technical materials through cartographic units or the Information Division.

1.352 Publications on range conservation. Range conservationists should present papers at technical and other meetings and prepare and publish articles on technical problems and other phases of SCS work. Publications may be primarily for inservice use. Range conservationists may also prepare articles for publication in scientific and other journals. If a manuscript for publication requires Washington clearance, it should be sent to the regional range conservationist for preliminary clearance before it is submitted to Washington.

- 1.36 Relations responsibilities. Under the guidance of line officers, range conservationists are expected to establish and maintain effective working relations in their particular technical field with agencies, organizations, and institutions, and assist them to gain an understanding of SCS objectives and procedures. Line officers must be kept informed of these activities. Agreements or commitments cannot be made without prior approval of line officers.

1.361 Range schools. It is SCS policy to maintain regular contact with heads and primary staffs of schools engaged in range research and education. Range conservationists must be aware of current academic thinking in range conservation and keep informed of current developments in fields of science related to range work. Correlating SCS activities with instruction of range schools brings about educational support for conservation programs. Schools and research agencies should be informed of research needs in the range conservation phase of the Soil Conservation Service program. Good working relations with range schools facilitate appraisal and recruitment of promising students for employment by the Service.

- 1.362 Personnel of other agencies. It is SCS policy to maintain working relations with personnel of other State and Federal agencies engaged in range work. Such agencies need to understand SCS procedures and objectives and be informed of SCS activities. Efforts should be made to arrive at a common understanding between such agencies and SCS, both on techniques involved and objectives. Agreement on standards with both State and Federal agencies concerned with range work is essential.
- 1.363 Livestock associations. At the direction of the appropriate line officer, range conservationists should maintain a working relationship with livestock organizations.
- 1.364 Soil conservation districts. Regular district events, such as meetings, tours, and contacts, are a proven way of promoting understanding and support for SCS range work. Activities sponsored by district officials who are conservation ranchers are most effective. Range conservationists should encourage such activities through the SCS representative designated to work with each district.
- 1.37 Functional inspections. Regional range conservationists, as directed by the Administrator, carry out functional inspection of range work within the States they serve. They advise State conservationists on technical activities and performance of the ranking range conservationists in the States. Within a State, range conservationists, as directed by the State conservationist, make or assist in making functional inspections of range work in areas and work units.

2.00 RANGELAND INVENTORIES FOR CONSERVATION PLANNING

2.10 Definition of rangeland

Rangeland is land on which the climax (natural potential) plant community is composed principally of grasses, grass-like plants, forbs, and shrubs valuable for grazing and in sufficient quantity to justify grazing use.^{1/}

Rangeland includes natural grasslands, natural savannas, wetlands suitable for grazing use and on which natural plant cover is dominated by mixtures of grasses, grass-like plants, forbs, and certain shrub and chaparral plant communities.

(In conservation planning, the planned land use of such land is rangeland if primary use is grazing. Some rangelands have alternatives for other primary land uses such as wildlife land, recreation land, and, if arable, cropland. In some instances seedings of introduced forage plants managed like range may be designated as rangeland.)

2.20 Purpose of rangeland inventories

Rangeland inventories of individual operating units provide a portion of the basic information needed by rangeland operators to develop sound conservation plans. An inventory is designed to inform an operator about the capabilities of the different kinds of rangeland in terms of the kind and quantity of vegetation they can be expected to produce. It also enables him to appraise the present condition of rangeland in relation to its potential.

Together with soil surveys, rangeland inventories provide the basic resource data needed to evaluate rangeland potentials and the need and feasibility of rangeland treatment. Such inventories also provide information useful in assessing such alternatives as wildlife and recreation use, and watershed values and treatments. (See the National Handbook for Conservation Planning.)

2.30 Method of rangeland inventory

SCS uses range site and range condition techniques to inventory rangelands in assisting range users in conservation planning. If suitable soil surveys are available, boundaries of range sites can be determined from soil maps. Current range condition within the delineated range site boundaries is determined when technicians assist operators to develop their conservation plans. In addition, inventories include water and wildlife resources, fences, roads, and other features important to resource conservation and development.

2.40 Range sites

2.41 Definition of a range site. A range site is a distinctive kind of rangeland that differs from other kinds of rangeland in its potential to produce native plants.

A range site is the product of all environmental factors responsible for its development. In the absence of abnormal disturbance and physical site deterioration, it supports a plant community characterized by an association of species different from that of other range sites in terms of kind or proportion of species or in total annual yield.

^{1/} "Climax" and "natural potential" are considered to be synonymous in meaning and may be used interchangeably.

- 2.42 Range sites in relation to climax communities. A plant community found on a range site in the absence of abnormal disturbance and significant physical site deterioration is the climax plant community for that site. It is the native plant community best adapted to the particular environmental complex of the site. As compared to other plant communities that may temporarily occupy the site, it is relatively stable and in dynamic equilibrium with the environment. The normal disturbances of nature such as drought, fire, and grazing by native fauna, are inherent factors in the development of this community. Its occurrence, therefore, is not always best typified by areas that have been artificially protected from such natural phenomena for extended periods of time.

The climax plant community of a range site is not a community of a precise assembly of species for which the relative composition is the same from place to place and from year to year. Variability within reasonable limits is the rule rather than the exception. At any given place and time, such variability is to be expected as the result of variations in microenvironment or as the product of natural disturbances. Over a period of years, variations in a climax community may occur as the result of variations in seasonal and annual growing conditions or other natural phenomena which favor some species at the expense of others. Despite such variability, a plant community is apparent in the relative persistence or reoccurrence of a characteristic pattern of species association.

The nature of such climax plant communities changes along environmental gradients. When the environmental gradient is characterized by gradual changes in climate along a line of soils with similar properties and relatively uniform topography, community changes are gradual. At a given point along the gradient, community changes may be abrupt and pronounced due to abrupt changes in soil, topography, or moisture regime.

Abnormal disturbance may result in pronounced changes or even complete destruction of a climax plant community. In the absence of pronounced physical site deterioration, secondary plant succession progresses in the direction of a climax plant community.

In the valley and foothill ranges of California, which are characterized by a Mediterranean climate, the original plant communities have been replaced by productive annual plant communities. Here the goal of management may be improving the present cover rather than restoring the original plant communities.

- 2.43 Determining the climax plant community of a range site. A number of methods, of which those listed below are the most important, are used in determining the nature of the climax plant community of a range site.

- a. Evaluation of relict vegetation and associated soils on areas that have been subjected to minimal abnormal disturbances.
- b. Evaluation of areas currently receiving varying degrees of grazing use, and similar areas excluded from such use.
- c. Evaluation of data from ecological, range management, and soils research dealing with the nature of plant communities.
- d. Review of early historical accounts and botanical literature.

Evidence from one of these sources is not likely to be conclusive in itself. In evaluating evidence, consideration must be given to such factors as drought versus unusually wet years, recent fire influences, excessive rodent concentration or insect damage, and excessive soil removal or deposition by wind or water. Every effort should be made to examine existing evidence throughout the area of occurrence of a range site. The initial description of the climax plant community should be considered an approximation subject to periodic change as additional knowledge is acquired.

- 2.44 Permanence of a range site. Range sites are subject to many influences that modify or even temporarily destroy vegetation but which do not preclude recovery or reestablishment of a climax plant community. Examples include drought, grazing,

2.44 Continued

fire, and even short-term tillage. Unless particularly severe, their effect usually can be corrected over a period of time by improved management or other measures and the potential of the range site itself is not permanently affected.

If these same influences, however, are sufficiently severe and prolonged to cause severe erosion, reduction in fertility, change in the water table, or other alteration of soil conditions to the extent that natural revegetation is seriously affected, the potential productive capacity of the original site will be changed. In such cases, a different range site consistent with its altered potential is recognized.

2.45 Distinctions between range sites. The only criteria used to separate one range site from another are:

- a. Differences in the kinds of plants that compose a climax plant community.
- b. Differences in the proportion of plants that compose a climax plant community.
- c. Differences in the total annual yield of climax plant communities.

If differences in these criteria, either singly or in combination, are great enough to require some variation in management (such as a different rate of stocking) a distinction between range sites is justified.

Differences in kind, proportion, and production of plants are due in large measure to differences in environmental factors such as soil, topography, and climate. Variations in such environmental factors are not in themselves criteria for site differentiation. Individual factors of environment are frequently associated with significant differences in native plant communities. Some of these differences are quite obvious. The presence or absence of a water table within the root zone, or the occurrence of highly alkaline as contrasted to non-alkaline soil is dramatically reflected in plant communities that such soils support. Similarly marked changes in soil texture, depth, and topographic position usually result in pronounced plant community differences. Therefore, such contrasting environmental conditions usually result in different range sites, and can be used to identify a site in the absence of climax vegetation. Distinctions between range sites are more difficult on areas with similar soils, relatively uniform topography, and gradual changes in climate. Under these conditions, changes in composition and production usually occur along a gradient. Consequently, the need for site differentiation may not be apparent until the cumulative impact of soil and climatic differences on vegetation is determined over a broad area. Frequently, such differences are reflected first in differences in yield and second in composition changes. Of necessity, boundaries of range sites along gradients of closely related soils and gradually changing climate are arbitrary.

The effect of any individual factor of the environment may vary, depending on other factors. Increased soil depth, for example, means more on a site that can take advantage of increased moisture from repeated overflow than it does on sloping upland. Similarly, an additional 2 inches of annual rainfall may be highly important in an arid section of the country but of minor significance in a humid climate. Similar variations in degree of significance apply to most factors of the environment. Consequently, consideration must be given to the total environment as well as to its individual components in determining a range site.

In evaluating differences in composition of rangeland in excellent condition, the relative importance of species may indicate whether one or more range sites are involved. For example, the potential composition of one range area may include 60 percent big bluestem (Andropogon gerardi) and 10 percent little bluestem (Andropogon scoparius). These percentages may be reversed on another area. Intensity of grazing and season of use should be based primarily on the requirements of big bluestem in the first case and little bluestem in the second. Two range sites are recognized even though their variation in total production of vegetation may be relatively minor.

2.45 Continued

Limits designating the point at which variations in composition or yield require the recognition of an additional range site vary with the kind of rangeland. For example, a difference in total annual yield of 100 pounds per acre, air dry, is of minor importance on sites capable of producing 2,000 to 3,000 pounds per acre, but would be highly significant on sites capable of producing only 200 to 300 pounds per acre.

In summary, criteria for differentiating range sites should be based on:

1. Significant variations in the kind or proportion of vegetation produced by the climax plant community.
2. Significant differences in the yield of vegetation produced by the climax plant community.
3. Avoidance of site differentiation on the basis of a single factor of environment, or a combination of factors, unless the effect from one or all is clearly reflected in significant variations in composition or yield.
4. Avoidance of site differentiation on the basis of factors that may influence grazing distribution but have little if any effect on relative composition or herbage yield.

- 2.46 Naming range sites. Range sites are named to aid users to recognize and remember the significant kinds of rangeland in their locality. Site names should be brief and based on readily recognized permanent physical features, such as the kind of soil, climate, topography, or combinations of these. The fact that vegetation changes, or in extreme cases may be absent, makes plant names, by themselves, unsuitable. However, combinations of permanent physiographic features and climax vegetation characteristic of a site may be used.

Typical examples of range site names based on these criteria include deep sand, sandy, sandy plains, silty, clay upland, saline lowlands, gravelly outwash, limestone breaks, pumice hills, subirrigated, wet meadows, fresh marsh, and sandy savannah.

Range areas with similar soils and topography may exhibit significant differences in their potential plant communities as a result of climatic differences. The average annual precipitation of the sandy plains of the Oklahoma Panhandle, for example, ranges from 16 to 23 inches. Quantitative evaluation indicates that significant differences in the amount of vegetation are produced in the 16 to 19 inch as contrasted to the 20 to 23 inch precipitation zones. In such cases, two range sites are recognized and are distinguished, one from the other, by the inclusion of the precipitation zone in the site name, i.e., "Sandy Plains 16-19 p.z. (precipitation zone)" and "Sandy Plains 20-23 p.z."

- 2.461 Correlation of range site names. The limited number of permanent physiographic or other features used in naming range sites makes some duplication of names inevitable. Deep sands, for example, may occur in widely divergent climates and support different natural plant communities. The name "deep sand" is appropriate in each of these cases but obviously is used throughout the country to designate several range sites. Such names should not be used for more than one range site within a land resource area unless modified by the addition of the applicable precipitation zone or other qualifying factor that serves to identify and distinguish one site from another.

2.47 Range site descriptions. A description of each range site identified and named in accordance with the preceding criteria is prepared. Such descriptions include:

1. The site name, including the precipitation zone or other qualifying factor if needed.
2. The geographic location of the range site (SCD or work unit), and the land resource area or areas in which it occurs.
3. Pertinent features of climate, including amount and distribution of precipitation and optimum growing season of the dominant forage plants. In lieu of a description of climate for each site, a single description may be used if climatic factors are essentially the same for several sites in an area. This description should be on a separate sheet in the technical guide.
4. A brief description of topography and approximate elevations.
5. A listing of soil taxonomic units (series, types, and phases) that have been assigned to the range site, and a brief explanation of significant characteristics of soil that directly influence plant, soil, and water relationships.
6. A brief description of the climax native plant community of the site, including a list of the more important decreaser and increaser species.
7. The approximate total annual yield of the climax plant community expressed as air-dry weight per acre in normal, favorable, and less favorable years. In work areas where examples of the climax plant community are lacking, use yields from the highest range condition class available. Identify the condition class in the site description.
8. The location of a typical example of the range site.
9. If needed, (1) the percent of ground covered by the potential plant community, and (2) a listing of tree species present with their approximate site indices.

Keep descriptions of range sites in the appropriate section of work unit technical guides. A suitable example of such a range site description appears as Exhibit 1.

2.48 Range sites and soil surveys. It is SCS policy to make soil surveys to collect essential soil information for use in conservation planning, for other users of soil maps, and to meet the requirements of the National Cooperative Soil Survey. Soil surveys on rangeland should be made in enough detail to supply soil information for conservation planning and related uses. Establishing mapping legends for surveys in these areas requires an understanding of the soil-water-plant relationships of rangelands and the needs and uses of soils information in ranch planning.

Soil scientists and range conservationists work as a team in developing a soil survey work plan, in determining composition of mapping units and organizing them into a legend, in reaching agreement on the intensity of mapping, in grouping soils into range sites, and in conducting field reviews. Soil scientists have final responsibility for determining composition of soil mapping units. Range conservationists have final responsibility for determining the groupings of soils into range sites. (See Soils Memorandum-38.)

2.481 Identifying range sites in areas where standard soil surveys are available. In areas where soil surveys have been completed and the field coordination necessary to insure correct interpretation of range sites from soil survey maps has been done, boundaries of range sites are determined directly from a soil map. The boundaries obtained in this manner may be outlined on the soil map or transferred directly to the conservation plan map of the individual unit. These boundaries are checked in the field during preparation of the conservation plan and any needed adjustments made at that time.

2.481 Continued

Soil mapping units which serve to delineate range sites may consist of one or more soil types, phases of soil types, complexes of soil types or phases, undifferentiated units, or miscellaneous land types. The degree of correlation between the number of soil mapping units and the number of mapping boundaries necessary to delineate range sites varies with the kind of rangeland being surveyed. If it is predominantly arable, the number of soil mapping units usually exceeds those needed to delineate range sites. More detailed information on changes in slope and other soil properties is needed in the management of cropland than is needed on rangeland. On extensive areas of nonarable rangeland the boundaries needed to delineate soil mapping units and range sites are frequently identical.

- 2.482 Identifying range sites before soil surveys begin. In areas where soils have not been identified, described, named, and mapped according to the national standards for soil surveys, the kinds of soil grouped in range sites are described on the basis of their properties and on the effects of these properties on plant growth.

For such areas a tentative soil legend together with appropriate site descriptions should be developed by a soil scientist and a range conservationist working together.

- 2.483 Soil interpretations for range use in published soil surveys. Soils Memorandum-55 (Rev. 1) establishes SCS policy and procedure for developing soil interpretations for range use. Such interpretations are included in soil survey manuscripts to be published in the standard series and in special surveys. (For details see Soils Memorandum-55 (Rev. 1))

- 2.484 Cartographic considerations. Within a specific area of rangeland range sites may be shown on a conservation plan map as (1) relatively large areas of a single range site, (2) a dominant range site interspersed with small inclusions of other range sites, or (3) a mixture of two or more range sites so interspersed that their separate delineation would not be practical or meaningful.

If a single range site or a site with less than 20 percent inclusion of other sites is delineated, the name of the range site or dominant site is shown on the map. If more than one site is shown within one mapping delineation, the name of each site with the approximate percentage of each is indicated, e.g., Loamy Upland 65% - Limestone Breaks 35%.

It is not practical to establish a minimum acreage for delineating range sites. The minimum area that needs to be delineated varies with relative productivity of a site, management unit size, mapping scale, size of ranch operating unit, and grazing use patterns. Range sites capable of producing high yields are usually delineated in more detail than sites of low potential productivity, but delineation of more detail than necessary should be avoided.

The size of maps should be commensurate with the size of the operating unit.

The intensity and detail of delineating range sites are determined locally, depending on kind of rangeland and type of ranching operation. Major consideration is given to the need for delineations that are significant to proper use and management of individual management units.

The boundaries of range sites are shown on a conservation plan map or soil map by solid lines. Names of the range sites are shown directly within the areas delineated or by appropriate symbols explained in a legend. Cartographic procedures, including use of symbols, abbreviations, and legends correspond to those established for the administrative area concerned.

2.50 Range condition

- 2.51 Definition of range condition. Range condition is the present state of vegetation of a range site in relation to the climax plant community for that site.
- 2.52 Definition of range condition classes. Range condition classes are an expression of the degree to which the present composition, expressed in percent, has departed from that of the climax plant community of a range site.

Four range condition classes are recognized:

<u>Condition Class</u>	<u>Percent of Present Composition that is Climax for the Site</u>
Excellent	76-100
Good	51- 75
Fair	26- 50
Poor	0- 25

- 2.53 Purpose of determining range condition. The primary purpose of determining range condition is to provide an approximate measure of changes that have taken place in the plant cover and thereby provide a basis for predicting the nature and direction of plant community changes to be expected from management and treatment measures.
- 2.54 Determining range condition. The range condition of an area of land within a range site is determined by comparing present vegetation with the climax plant community as indicated by the range condition guide for the site. (Special criteria for determining range condition are used for Mediterranean climate annual ranges if it is desirable to manage for species other than the original vegetation.) To facilitate this process components of the vegetation are segregated according to their response to the kind of grazing use on specific range sites. These component categories are decreaser, increaser, and invader plants.
- 2.541 Decreaser plants. Decreaser plants are species in the climax plant community that decrease in relative abundance when such a community is subject to continued excessive grazing use. Usually the decrease results from excessive grazing associated with high specific animal preference for the species during the season of use involved. Some species, even though their grazing preference is low, may decrease due to adverse changes in microenvironment induced by grazing use of other plants.
- The total of all such species is counted in determining range condition class.
- 2.542 Increaser plants. Increaser plants are species in the climax plant community that usually increase in relative abundance when the community is subject to continued excessive grazing use. However, not all increaser plants respond in this simple fashion. Some of moderately-high grazing preference may initially increase then decrease as grazing pressure continues. Others of low grazing preference or negligible grazing value may continue to increase either in relative composition or in actual plant numbers. Under prolonged excessive grazing, increaser plants may dominate the site.
- Range condition guides indicate the maximum percent composition of increaser species usually expected in the climax plant community for each site. In determining range condition class, count up to but do not exceed these maximum percentages for increaser plants.

2.543 Invader plants. Invader plants are not members of the climax plant community for the site. They invade the community as a result of various kinds of disturbance. They are not restricted to exotics, however, as they may be normal components of the climax plant community on other range sites in the same locality. They may be woody or herbaceous annuals or perennials. Their forage value and relative grazing preference may be high or low. Invader plants are not counted in determining range condition class.

2.544 Other factors relating to decreaser, increaser, and invader species. Many factors influence the response of individual plant species and plant communities to grazing. There are few if any universal decreaser or increaser species. Some factors to consider in designating decreaser, increaser, and invader species in the range condition guide for a range site include the following:

- a. A plant species may be a decreaser on some sites but an increaser or an invader on other sites.
- b. On a specific range site, a species may respond as a decreaser for one kind of grazing animal and as an increaser for another kind of grazing animal.
- c. Season of grazing use influences the response of species to grazing.
- d. Relative grazing value and grazing preference is not a factor in designating invader species. Some invader plants have high grazing values.
- e. Designation of decreaser, increaser, and invader species is based on their response when grazing pressure is applied to the climax plant community of a site. Such grazing pressure generally results in a trend in range condition that is a departure from climax. An identical pattern of grazing response does not occur when rangeland in deteriorated range condition exhibits an upward trend in range condition. Failure to recognize this basic distinction can lead to an erroneous placement of species.

2.55 Guides for determining range condition class. Guides for determining range condition are prepared for each range site. These guides include a list of (1) the significant decreaser species, (2) important increaser species and the maximum percent in the climax community for each species or appropriate species grouping, and (3) common invader species.

Suggested initial stocking rate tables by range site and range condition may be added to a range condition guide or presented as a separate table.

For most range sites the relative importance of the individual decreaser species varies materially. Since the total of this species is counted toward climax condition, most guides do not identify this variable. For example, on a range site, Indiangrass may comprise less than 5 percent of the climax plant community while big bluestem may comprise 45 percent. Obviously big bluestem is of major significance in management while Indiangrass is of minor importance. Unless such facts are known to conservationists assisting range-land operators and to the operators themselves, serious mistakes may result in establishing management objectives. In those areas and for those sites where this problem exists, a numerical yield rating index similar to that listed below may be used to indicate the relative importance of decreaseers. The appropriate rating number for each decreaser species is shown directly on the range condition guide.

Numerical yield rating index for decreaser species:

1. Always present, more than 50 percent of potential total annual yield.
2. Always present, makes up 25-49 percent of total potential annual yield.

2.55 Continued

3. Generally present, makes up 10-24 percent of potential total annual yield.
4. Frequently present, makes up less than 10 percent of potential total annual yield.
5. Occasionally present, makes up less than 5 percent of potential total annual yield.

A range condition guide for each range site may be written separately or guides for two or more sites may be shown on a spread sheet. Individual range condition guides written on separate pages have the advantage of clearly portraying the nature of the plant community for each site. Spread sheet guides have the advantage of conveniently illustrating some of the differences in climax plant communities of several sites, but if too many sites are included it becomes increasingly difficult for other than skilled technicians to gain a clear picture of an individual site. Samples of range condition guides and range condition worksheet are Exhibits 2 through 5. They are patterned after guides in current use but have been modified to illustrate certain factors.

2.56 Developing and revising range condition guides

2.561 Developing range condition guides for newly identified range sites.

- a. Areas for which plant communities representative of the potential are available.

Step 1. Determine plant composition, by weight, of the potential plant community.

- (a) Select several sample areas, preferably a minimum of five that represent the potential for the site.
- (b) On each sample area determine the total air-dry weight of each species on randomly located plots (in any case, a minimum of 10 plots). Do this by harvesting or a combination of harvesting and estimating weight. If tree species are involved, determine their yield as outlined in Sections 4.132 and 4.136.
- (c) Using the total weight of each species, compute the percent composition by weight for each sample area.

Step 2. Develop a tentative range condition guide for the site from the composition percentages of the sample areas.

NOTE: Because of inherent variation in the composition of potential plant communities, the average composition of the sample areas is not a valid basis for establishing the maximum percent of increaser species to be shown on a range condition guide. Assuming that sampling was adequate, the maximum percent of any increaser species shown on a guide will be the highest percent found on any of the sample areas. (This is the maximum percent for a sampling area--not for a single plot within a sampling area).

Step 3. Develop the final range condition guide for a site.

- (a) Test the tentative guide by determining the range condition class ratings of areas of the site which support various kinds of plant cover other than that recognized as the potential.
 - (b) If testing and use indicate shortcomings in the tentative guide, repeat Step 1 on additional areas representing the potential for the site. If no shortcomings are apparent, use the tentative guide as the final guide.
- b. Areas for which plant communities representative of the potential for the site are not available.
- (1) Differentiate range sites and develop range condition guides on the basis of approximations of the present potential.
 - (2) Give consideration to historical evidence of original cover. However, before concluding that the original cover is still the potential, carefully evaluate the comparability of environmental conditions.
 - (3) In the absence of reliable historical evidence, the present potential must be approximated on the basis of the gradation of climax vegetation along environmental gradients.

2.562 Revising existing range condition guides. This usually involves adjusting the composition percentages now used in the guide. Need for adjustments are indicated by:

- (1) Initial training and continued self-training in estimating yield and composition by weight.
- (2) Collection of documentary yield data for range sites and various range condition classes.
- (3) Determination of yield and composition, by weight, of plant communities representing the potential for a site.

If modifications are minor, make pen and ink changes on existing guides.

2.563 Worksheet for determining range condition. A sample worksheet for field determination of range condition is illustrated in Exhibit 6. Conservationists are encouraged to determine range condition on site with rangeland users. A worksheet of this kind is useful for this purpose. Usually, a suitable worksheet is used in determining range condition for several range sites and in several pastures within an operating unit. Completed copies may be left with a rangeland user or filed in the plan folder.

2.564 Special situations in determining range condition. In certain situations the single criterion of comparative plant composition is an inadequate measure of range condition class. For such cases, additional locally adapted criteria to determine range condition class must be developed. Examples of such situations, and of the additional criteria used to determine range condition include the following:

Example No. 1: Abnormally high production of annuals

An exceptionally favorable set of growing conditions may result in unusually heavy but temporary production of annual vegetation without a major change in the stand of perennial vegetation (particularly on rangeland in other than excellent condition.) If this abnormally high production is counted, it lowers condition ratings by one or more classes in a single year even though the basic matrix of perennials is little changed.

For such a situation, base the condition rating on the present perennial vegetation plus the production of annuals which experience indicates is associated with ordinary years.

Example No. 2: Sparse stand of decreaser species with few, if any, increaser or invader species

As compared to the association of species found in the climax plant community, the existing plant cover consists of a sparse but relatively pure stand of a decreaser species (such as alkali sacaton or alluvial soils, or bluebunch wheatgrass on a steep south facing slope with no annuals of understory species between the bunches). In such cases, lower the condition class rating based on composition because of the inadequate production of decreaser species, giving due consideration to current growing conditions. The extent to which condition class may be lowered is based on local criteria such as (1) if productivity of decreasers is approximately 50 percent of potential - lower rating by one class, and (2) if productivity of decreasers is less than 25 percent of potential - lower rating by two classes.

Example No. 3: Small number of high yielding decreasers in a dense stand of low yielding increasers or invaders

On abandoned cropland where a small number of tall decreaser grasses occur in the climax plant community, they may weigh more per acre than the dense stand of low yielding species with which they are growing. The range condition rating based on composition by weight may be one or more classes higher than is logical for this situation.

In such cases, lower the condition rating because of inadequate production of decreaser species. Use criteria comparable to those outlined for Example No. 2.

2.60 Trend in range condition

Range condition classifies the present vegetation of a range site in relation to the potential for that site. Knowing the condition, however, does not indicate whether the range is improving or deteriorating. Trend is a separate determination, frequently necessary to plan the adjustments in grazing use and management needed to maintain or improve the range resource. The following are among the more important characteristics of both vegetation and soil that indicate apparent trend in range condition:

- 2.61 Abundance of seedlings and young plants. Improvement of a deteriorated plant community is dependent on reproduction by the individual plants naturally dominant for the site. Effective reproduction is evidenced by young seedlings, presence of plants of various age, and spread by tillers, rhizomes, stolons and similar methods of vegetative propagation of the desired species. The extent to which any of these types of reproduction occur varies with the growth habits of the individual species and with current growing conditions. Vigorous plant reproduction by species that are most attractive to livestock is evidence of a trend of improving range condition. However, few seedlings are able to establish themselves on range in excellent condition.

2.62 Plant residue. The extent to which plant residues accumulate depends primarily on (1) production level of the plant community, (2) amount of plant growth removed by grazing, haying, fire, wind, or water, and (3) amount of plant growth decomposed in place. In hot, humid climates, rates of plant residue decomposition are so great that there is no net accumulation. Conversely, in cold climates, rates of plant decomposition are slow. In using plant residues to judge trend in range condition, careful consideration should be given to the level of accumulation that can be expected for the specific site and climate. Excessive grazing use, below-normal herbage production, recent fires, and abnormal losses resulting from wind or water erosion may result in levels of plant residue accumulation below those considered reasonable for the site. In the absence of these factors, however, with few exceptions, progressive plant residue accumulation is indicative of improving range condition. In the Mediterranean climate annual range type, plant residues are especially important, being the measure of proper range use and the prime criteria in management. Without adequate residues on these rangelands the plant composition deteriorates and forage production drops rapidly. Conversely, if repeatedly under-utilized, less desirable plants replace the more desirable ones.

2.63 Composition changes. Although the native plant community that represents the potential for a range site is relatively stable, it is in no sense static. Major changes in plant composition do not occur, however, unless induced by pronounced disturbance such as continued heavy grazing use or severe or prolonged drought. When range condition is declining as a result of heavy grazing use, those perennial species most attractive to livestock and most susceptible to damage by grazing decrease. An increase in species of low grazing preference also generally indicates a trend toward a lower range condition.

When disturbances that cause a decline in range condition are corrected, plant succession operates to reestablish the climax plant community for a site. Plants that have decreased will increase if sources of seed or vegetative parts are still available. To varying degree, plants that have increased as a result of declining range condition now tend to decrease. However, certain woody and some other long-lived perennial plants are an exception to the general rule; once established they may persist for a long time.

Generally, the invasion of plants not native to the site indicates a decline in range condition. Plants of this kind may flourish temporarily on localized disturbed areas when the site as a whole is in good condition. In addition, some invaders, particularly annuals, may temporarily flourish in favorable years even when range condition is improving. A material, though temporary, increase in annuals and short-lived perennials may also occur in wet years even though the trend in range condition is upward.

Changes in plant composition, whether from declining or improving range condition, generally follow a pattern. Although all details of changes in species composition are not predictable, successional patterns for specific soils, climates, and grazing use can be predicted.

2.64 Plant vigor. Plant vigor is reflected primarily by the size of a plant and its parts in relation to its age and the environment in which it is growing. Many plants that form bunches or tufts in a vigorous condition may assume a sod form if their vigor is reduced. Length of rhizomes and stolons is also a good indication of the vigor of a parent plant; these parts are usually reduced in length and number when a plant is in a weakened condition. Caution: Do not assume that an apparent lack of vigor is due to excessive grazing, especially during drought periods or on sites with obvious limitations for plant growth. In using vigor to evaluate trend in range condition, evidence of increased vigor of decreaser species and other plants with high grazing preference indicates improving range condition.

2.65 Condition of the soil surface. Unfavorable conditions of the soil surface may drastically affect trend in range condition and rate of range recovery. Lack of plant residues permits splash erosion and crusting of the soil surface. This impedes water intake, inhibits seedling establishment and vegetative propagation, and induces high surface temperatures. These conditions, in turn, increase rates

2.65 Continued

of water runoff and soil loss, reduce effective soil moisture, and for most soils result in unfavorable plant, soil, and water relationships. An increase in bare ground, soil crusting, compaction from trampling, plant hummocking, and erosion indicate a declining trend in range condition which has been in effect for some time.

The relative importance of the several factors discussed above will vary with differences in vegetation, soils, and climate.

The evaluation of any one of them on a particular range site may indicate whether range condition is improving or declining. Ordinarily, however, a more sound decision will be reached if all of them are considered in their proper relation to each other.

2.70 Mapping procedures for range condition

2.71 Boundaries of range condition classes. The boundaries of range condition classes within the boundaries of range sites are shown by dotted lines. Range conditions are designated on the map by name or by appropriate symbols explained in the legend.

2.72 Seeded areas of native or introduced species. Seeded areas of native or introduced species are delineated and labeled as such. Names of principal seeded species and an indication of relative stand may also be shown. Range condition is not determined for such areas except when native grass seedings develop characteristics of the native plant community for the site.

2.80 Development and use of initial stocking rates by range sites and condition classes.

Appropriate stocking rates vary for different range sites and range conditions within range sites because of variation in kind, proportion, and production of plant species. The process of determining range site and range condition does not involve computations of stocking rates. These are associated with range sites and range condition as a result of actual grazing use experience.

The most reliable basis for developing appropriate initial stocking rates consists of a combination of actual use records of individual range sites, a determination of the degree of use to which they have been subjected, and an evaluation of the trend in their condition. Such records should extend over a period of years that include seasons of high, low, and near-average forage production.

Yield estimates are made to determine the production of individual range sites in different range conditions. Extended over a period of years, such data indicate the approximate yield and the variations in production that may be expected in favorable and unfavorable years.

The purpose of developing initial stocking rates by range sites and condition classes is to provide landowners requesting such information with a guide to the intensity of grazing. Such guides are not "grazing capacity estimates." Seasonal and annual variations in forage production require timely adjustments in stocking rates to insure range proper use. Initial stocking rates are also helpful in planning balanced forage and feed needs for each season of the year.

3.00 GRAZABLE WOODLAND

3.10 Definition of grazable woodland

Grazable woodland is forest land on which understory includes, as an integral part of the forest plant community, plants which can be grazed without significantly impairing other forest values.

On such forest land, grazing is compatible with timber management if controlled in a manner that maintains or enhances both timber and forage resources.

Some examples of grazable woodland are the ponderosa pine and certain aspen forests of the West, and the longleaf pine and slash pine forests of the South.

3.20 Factors affecting forage production and grazing use

Forage production of grazable woodland may vary according to:

- a. Different kinds of grazable woodland.
- b. Environmental variations within a specific kind of grazable woodland.
- c. Variations in shade cast by tree canopies.
- d. Accumulation of fallen needles.
- e. Whether or not trees are thinned or pruned.

Time and intensity of grazing markedly influence plant composition and forage production. Excessive grazing use lowers forage production potentials and can result in damage to tree reproduction.

Number, size, and spacing of trees is a major influence in both the composition and productivity of understory. Increasing shade lowers understory productivity; those species that are not shade tolerant decrease in number or die. The understory of dense tree stands may be limited to a sparse stand of shade tolerant species. Maximum production of herbaceous species usually occurs on clear-cut areas. Minimum production is usually associated with dense stands of sapling and pole-size trees.

3.30 Grazing guides for grazable woodland

3.31 Purpose of grazing guides. Grazing guides assist land owners and operators to appraise forage resources and develop management objectives for their grazable woodland. Guides are placed in the appropriate section of work unit technical guides.

3.32 Contents of grazing guides. Grazing guides consist of:

- a. A brief description of the specific kind of forest plant community to which the guide applies.
- b. A list of understory species shown in categories of high, moderate, low, and no grazing value, or as species that decrease, increase, and invade, based on response to excessive grazing use.
- c. A table of suggested initial stocking rates based on variations in forage quantity and quality as modified by percent of tree canopy. Modifications of stocking rates for variations in forage quantity and quality and for percent tree canopy are based on locally determined data and actual grazing use records.

3.33 Development and use of grazing guides

- 3.331 Land area to which the grazing guide applies. A grazing guide applies to areas of grazable woodland having reasonably comparable grazing and forage production potentials.

In most instances a guide applies to the soils and land area assigned to one or several woodland suitability groups.

Grazing guides may be developed for subdivisions of a woodland suitability group when the woodland suitability group encompasses more than one area of comparable grazing and forage production value.

In areas where woodland suitability groups have not been developed, grazing guides may be based on an appropriate grouping of soils which reflect forage production potentials.

- 3.332 Determining the nature of grazable woodland plant communities. Existing plant communities of grazable woodland are highly variable as a result of past use and management. Past logging practices, grazing, fire, insect damage, disease, and other forms of disturbance affect tree overstory and herbaceous understory. In developing grazing guides make careful field observations of plant communities representative of these variable conditions. Study descriptions of woodland suitability groupings and soils involved. Study pertinent literature and research data. Based on these observations and studies plus an evaluation of actual grazing use, develop a grazing guide. Unless local research studies or field experience indicate otherwise, use the following tree canopy classes:

<u>Canopy Class</u>	<u>Percent of Ground Shaded</u>
Open	0-20
Sparse	21-35
Medium	36-55
Dense	56-70

A sample grazing guide is illustrated in Exhibit 7. This sample is for a single woodland suitability group. Since the description of the woodland suitability group includes the appropriate grouping of soils, this information is not repeated in the grazing guide.

3.40 Determining yield of Forage Species

Total yield of understory species which is within reach of livestock and game animals is determined on an air-dry weight basis as for rangeland. The annual yield of trees and species which, because of height, have no grazing value is not determined.

4.00 DETERMINING APPROXIMATE RANGE PLANT YIELDS AND COMPOSITION BY WEIGHT

4.10 Determining approximate range plant yields

4.11 Need for including all species in determining yield. Rangeland may be used or have potential for use by livestock and wildlife, as recreation areas, as a source of certain wood products, and for other soil and water conservation purposes. Values of plant species for domestic livestock often are not the same as for game animals, game birds, recreation, beautification, and watershed protection. Comprehensive interpretation of data on yields from range vegetation, therefore, requires that yield determinations include all plant species producing measurable yield. Further, the principles and concepts of range site and condition are based on the total plant community rather than only on those species having value for domestic livestock use.

4.12 Categories of Plant Yields. The total annual production of all plant species of a plant community is designated as "total annual yield." For specific purposes, yield of certain species or groups of species may be identified as "herbage yield" for all herbaceous species, "woody-plant yield" for woody species, "yield of forage species" for species grazed by livestock, etc. "Usable forage" is a variable interpretation of yield data rather than a definitive expression of yield as such, and is not used.

4.13 Criteria and methods for determining yield

4.131 Components of yield

- a. Yield determinations include all plants (usually excepting mosses and lichens) regardless of height or accessibility to livestock.
- b. Yields are based on total growth during a single production year, excepting only growth due to increase in stem diameters of trees and shrubs. Also excluded is all plant residues of previous production years.

4.132 Definition of annual yield for various range plants

- a. Grasses, (except bamboos), Grasslike Plants, and Forbs.
 1. Yield includes all above-ground production of leaves, stems, inflorescences, and fruits of a single production year.
- b. Woody Plants (in four categories):
 1. Deciduous trees, shrubs, half-shrubs, and woody vines.
 - (a) Yield includes leaves, current twigs, inflorescences, and fruits produced in a single production year.
 2. Evergreen trees, shrubs, half-shrubs, and woody vines.
 - (a) Yield includes only current leaves, twigs, stems, inflorescences, and fruit of a single production year. Current leaf production can be determined by identifying and collecting current leaves or by dividing the weight of all leaves by the average leaf life span in years.
 - (b) For species requiring 2 years for fruit maturity, half the weight of mature fruit is current yield.
 3. Yucca, Agave, Nolina, Sotol, and Saw-palmetto.
 - (a) Yield consists of new leaves and enlarged old leaves plus the fruiting stem and fruit of a single production year.

- (b) Until more specific data are available, and if current growth is not readily distinguishable, current yield is considered as 15 percent of the total green leaf weight plus the weight of current fruiting stems and fruit. Adjustments in this percentage are made in years of obviously high or low production.

4. Cacti (in three categories).

- (a) Prickly pear and other pad-forming cacti.
Yield consists of pads, fruit, and spines produced in a single production year plus the enlargement of old pads in that year. Until more specific data are available, and if current growth is not readily distinguishable, current yield is considered as 10 percent of the total weight of pads plus current fruit production. Adjustments in this percentage are made for years of obviously high or low production.

- (b) Barrel-type cactus.

Until specific data are available, current yield is considered as 5 percent of the total weight of the plant, other than fruit, plus the weight of fruit produced in a single production year.

- (c) Cholla-type cactus.

Until more specific data are available, and if current growth is not readily distinguishable, current yield is considered as 15 percent of the total weight of photosynthetically active tissue plus the weight of fruit produced in a single production year.

4.133 Factors for converting green weight to air-dry weight. All yields are to be expressed as air-dry weight in pounds per acre. Procedures and factors for converting green weight to air-dry weight are as follows:

Based on currently available data, percent of total weight that is air-dry weight for various types of plants at different stages of growth are listed in the following table. These percentages are based on limited data and are intended for interim use. As additional data from research and field evaluations become available, revise these figures. Air-dry weight percentages for species listed may be used for other species having similar growth characteristics.

Some interpolation must be done in the field to determine air-dry matter percentages for growth stages between the stages listed.

For species not listed and for which data for other species are not applicable, it will be necessary to dry sufficient samples of harvested material to determine proper air-dry weight percentages.

PERCENT AIR-DRY MATTER IN HARVESTED PLANT MATERIAL
AT VARIOUS GROWTH STAGES

Before Head- ing Initial growth to boot Stage	Headed Out Boot Stage to flowering	Seed Ripe Leaf tips drying	Leaves Dry Stems partly dry	Apparent Dormancy
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GrassesCool-Season Grasses

35	45	60	85	95
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Wheatgrasses
Bromes
Bluegrass
Prairie Junegrass

Warm-Season Grasses

a. Tall Grasses

30	45	60	85	95
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Bluestems
Indiangrass
Switchgrass

b. Mid Grasses

40	55	65	90	95
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Sideoats grama
Tobosa
Galleta

c. Short Grasses

60	80	90	95
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Blue grama
Buffalograss
Short 3-awns

New leaf & twig growth until leaves fullsize	Older and full sized green leaves	Green Fruits	Dry Fruits
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Evergreen coniferous trees

45	55	35	85
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Ponderosa pine-slash-longleaf
Utah Juniper
Rocky Mountain Juniper
Spruce

Live Oak

40	55	40	80
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Deciduous trees

40	50	35	85
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Blackjack oak
Post Oak
Hickory

PERCENT AIR-DRY MATTER IN HARVESTED PLANT MATERIAL
AT VARIOUS GROWTH STAGES

		New leaf & twig growth until leaves fullsize	Older and full sized green leaves	Green Fruits	Dry Fruits
<u>Shrubs</u>					
a. Evergreen		55	65	35	85
Big sagebrush					
Bitterbrush					
Ephedra					
Algerita					
Gallberry					
b. Deciduous		35	50	30	85
Snowberry					
Rabbitbrush					
Snakeweed					
Gambel oak					
Mesquite					
<u>Yucca and Yucca-like plants</u>		55	65	35	85
Yucca					
Nolina					
Sotol					
Saw-palmetto					
	Initial growth to flowering	Flowering to seed maturity	Seed ripe, Leaf tips dry	Leaves dry, Stems drying	Dry
<u>Forbs</u>					
a. Succulent types	15	35	60	90	100
Violet					
Waterleaf					
Buttercup					
Bluebells					
Onions, lilies					
b. Leafy types	20	40	60	90	100
Lupine					
Lespedeza					
Compassplant					
Balsamroot					
Tickclover					
c. Fibrous leaves or mat types	30	50	75	90	100
Phlox					
Mat Eriogonums					
Pussytoes					
	New growth pads and fruits	Older pads	Old growth in dry years		
<u>Succulents</u>					
Prickly pear and Barrel cactus types		10	10	15+	
Cholla cactus		20	25	30+	

4.134 Method of determining approximate yield

- a. Yields are to be determined by harvest or a combination of actual harvest and direct weight estimates. Sufficient harvest will be done to assure reasonable accuracy in estimation.
- b. All documentary yield data for purposes such as range site descriptions, grouping soils into range sites, initial development of range condition guides, and determination of yield by range condition classes are to be obtained by harvest and estimates of plots. Adapt size, shape, and number of plots to the kind of plant cover being sampled. For convenience in converting yield in grams per plot to yield in pounds per acre, use the following conversions:

On 0.96 square foot plots, multiply yield in grams by 100.

On 1.92 square foot plots, multiply yield in grams by 50.

On 2.40 square foot plots, multiply yield in grams by 40.

On 4.80 square foot plots, multiply yield in grams by 20.

On 9.60 square foot plots, multiply yield in grams by 10.

On 96.0 square foot plots, multiply yield in grams by 1.

For tree-type vegetation, plots of 0.10 acre or a series of 10 plots 0.01 acre in size are most usable. Yield determinations on rangeland supporting trees often involve use of small plots for understory species and large plots for tree species. A plot 4.356 ft. wide and 1000 ft. long is useful when sampling areas which include unevenly spaced trees.

- c. In harvesting or estimating plants on plots, use only those plants whose stems originate in a plot; this includes plants whose aerial portions extend beyond a plot boundary. Exclude all portions of plants whose stems originate outside a plot even though their foliage may overlap into the plot.

4.135 Determining yield for range site descriptions and for range condition classes

- a. Yield determinations required for range site descriptions are made as follows:
 1. Tabulate yield data by harvest and estimate from plots of the potential plant community for a site.
 2. Obtain yield from vegetation that has not been grazed since the beginning of the current growing season.
 3. Make yield determinations near or shortly after the end of the growing season of the major species. Give due consideration to species that mature early in the growing season. For some plant communities, this may require more than one determination during a single production year.
 4. Repeat yield determinations in different years to reflect variation in yield from year to year.
- b. The above procedures also are used to develop yield data for the various range condition classes of a range site; in doing this, collect data from areas that represent specific range condition classes of the site within a single production year.

4.136 Determining yield for tree-type vegetation on rangeland

- a. Determining yield of tree and large shrub species by harvest of portions of stands is time consuming and, therefore, impractical for regular field operation planning procedures. Research workers are developing methods of associating current yield of some species with measurements of such factors as crown width or height and basal areas. These data, coupled with guidelines developed by range conservationists using procedures outlined here, are to be used to approximate annual yield of tree-type species.
- b. Range conservationists are responsible for developing yield guides for various kinds of tree stands for use by work unit personnel.

Range conservationists may use the following procedures in developing guides:

1. Select a few sample trees for each species. Samples should include variations in tree size, form and spacing.
2. Determine current yield of sample trees.
3. Base yield determinations on a combination of harvest and estimate. For estimates, develop appropriate "weight units." These may be an entire small tree or a branch or cluster of branches from larger trees. Yield determinations from sample trees should include all components of current yield except bark and wood of other than current twigs. Field determinations of yield, however, may be based on current leaf production only if data have been developed indicating the percent that various components of yield contribute to total yield.
4. Expand yield estimates to plots one-tenth acre or larger. Record yield of each tree species. Also make a record of appearance and aspect of the plot in terms of component species, tree sizes, form, number and canopy.
5. Repeat this process for various kinds of tree stands. On the basis of data thus collected, develop guides listing approximate current yields for various kinds of tree stands. (See Exhibit 8.)
6. If range condition guides do not now include trees as a part of total plant composition, revise them. Include composition by weight of trees that are a part of the climax plant community.

4.20 Determining approximate plant composition by weight

4.21 Composition percentages by species of a plant community are determined by:

- a. Converting harvest of different species to percent composition by weight.
- b. Converting estimated yield of component species to percent composition by weight.
- c. Converting yield of component species, as determined by a combination of harvest and estimate, to percent composition by weight.

4.21 Continued

- d. Directly estimating percent composition by weight of component species. (This method requires knowledge of relative weight of species acquired by actual harvest plus training and experience in estimating relative composition.)

4.22 Plant composition data for range condition guides. Plant composition data for range condition guides are computed from yields obtained by harvest or from a combination of harvest and estimate of yield by species in plots.

4.23 Plant composition data for conservation planning. Plant composition by weight for the area comprising a single range condition class of a single range site within a pasture may be determined by:

- a. Directly estimating plant composition of the entire area as a unit, or
- b. Estimating, or a combination of harvest and estimation, plant composition of a series of sample plots within the area.

During conservation planning, it is necessary to determine plant composition at various times of the year for grazed and ungrazed pastures. Various range condition classes and stages of plant growth, years of high and low plant production, and plants in different states of vigor must be taken into account. In making composition estimates of any pasture, it is necessary to mentally reconstruct growth as it would appear if undisturbed at the end of an ordinary growing season.

4.30 Estimation of range plant yields and composition by weight

4.31 The weight unit concept of a given volume of plant material varies significantly by species and within species. Differences in growth form, condition of material at time of harvest, and degree of compaction affect weight. Weight of a given volume, therefore, is not a constant. For this reason, base yield and composition determination on estimates of weight rather than simply comparing relative volumes.

The "weight unit" method is an efficient means of estimating plant yield and lends itself readily to self-training. This method is applied as follows:

- a. A "weight unit" is established for each plant species.
- b. A "weight unit" may consist of a portion of a plant, an entire plant, or a group of plants. (See Exhibit 9).
- c. Size and weight of a unit should vary with kind of plant. For example, a 5 to 10 gram unit is suitable for small grass or forb species. Weight units for large plants may be from several hundred to several thousand grams or several pounds.
- d. Factors taken into account in addition to plant size include:
 1. Length, width, thickness, and number of stems and leaves.
 2. Ratio of leaves to stems.
 3. Specific gravity of different species.
 4. Growth form and relative compactness of species.
- e. Establishing the "weight unit" for a species:
 1. Decide on weight in pounds, ounces, or grams of a unit that would be convenient for the species.

2. By visual appraisal select a portion of a plant, an entire plant, or a group of plants thought to equal this weight. Harvest and weigh the plant material to determine actual weight. Repeat this process until the desired weight unit can be estimated with reasonable accuracy. After the weight unit has been initially established, proficiency in estimation is maintained by periodically harvesting and weighing estimated weight units.

f. Estimating yield and plant composition by weight:

1. On a single plot:

Estimate yield by counting the weight units of each species in the plot.

Estimate composition by weight for the plot.

Convert weight units for each species to yield in grams, ounces, or pounds.

Harvest and weigh each species to check estimates of yield.

Compute composition from actual yield to check composition estimates.

Repeat the above process until proficiency in estimating is attained.

Keep the harvested materials, when necessary, for air-dryings and weighing to convert from field (or green) weight to air-dry weight.

Thereafter, periodically repeat the process to maintain proficiency in estimating.

2. On an area of rangeland in a single range condition class of an individual range site:

- (a) First estimate composition by weight of the area to gain experience in making direct estimates of composition.
- (b) Estimate yield in pounds per acre of individual species within the area.
- (c) Compute composition of the area from estimated yield data as a check of direct composition estimates.
- (d) To further check these direct estimates of the area as a whole, estimate yield by species of a series of plots deemed an adequate example of the area.
- (e) Compute average yield of the plots in terms of pounds per acre. Using these average yield data, compute average composition. Although this procedure may miss some species of minor importance, it provides a useful check on estimations.
- (f) Repeat this procedure until proficiency is attained.

5.00 CONSERVATION TREATMENT OF RANGELANDS

Conservation treatment of rangeland involves planning and applying range management and conservation practices which fall into three broad groups: Plant management practices, accelerating practices, and livestock control practices. Such range practices as range proper use, deferred grazing, rotation-deferred grazing, etc., relate to forage management. Range seeding, brush control, and other practices specifically designed to "speed-up" improvement of range cover over that obtainable through grazing management alone are accelerating practices. The third group, livestock control practices, facilitate handling livestock and include such practices as fencing, stock watering facilities, etc.

5.10 Plant management practices

- 5.11 Range proper use. Range proper use is defined as grazing rangeland at an intensity which will maintain adequate cover for soil protection and maintain or improve the quantity and quality of desirable vegetation.

Range proper use is applicable on all ranges used for grazing by livestock or game animals.

- 5.111 Helping cooperators develop appropriate range management objectives.

Grazing values of plant communities vary with kinds of animals and seasons of use. Excellent range condition class is often the range management objective. However, there are times when excellent range condition is not a goal. For certain kinds of sites, animals, and certain seasons of use, a range below excellent condition may provide adequate soil protection and at the same time yield the desired quantity and quality of forage.

For most pastures, there are several range management alternatives which may include:

- a. Management aimed at maintaining excellent condition.
- b. Management aimed at restoring excellent condition.
- c. Management aimed at perpetuating a plant cover that is lower than excellent condition. Such an objective should apply only when the plant cover will:
 1. Provide for soil and water conservation.
 2. Provide adequate amounts of good quality forage, at least seasonally, for the kinds of animals involved.

- 5.112 Key grazing areas and key species on which to judge the degree of grazing use. In planning range proper use for a pasture, careful consideration must be given to the distribution of grazing. The individual range pasture is the grazing management unit. Every pasture has certain characteristics which influence the distribution of grazing use. These include: topography; size of pasture; location of water, fences, and natural barriers; and the kind and distribution of forage plants. In addition, such factors as season of grazing, weather, salting, climate, and the kind of grazing animals affect the pattern of grazing use.

- a. Characteristics of a key grazing area

1. Provides a significant amount, but not necessarily the majority, of the available forage within a pasture.
2. Is easily grazed because of even topography, accessible water, and other favorable factors influencing grazing distribution. (Small areas of natural livestock concentration, such as those immediately adjacent to water and salt are not key grazing areas).

3. Generally consists of a single range site or portion thereof.
4. Is usually in a single range condition class, but may include more than one range condition class.
5. Is usually limited to one key grazing area per pasture, except in some unusually large pastures or in pastures where more than one species of animal is grazing a pasture at the same time, or where a pasture is grazed at different seasons.

b. Selecting key grazing area

An understanding of key areas by the cooperators can best be developed when he participates with the conservationist in:

1. Making a careful evaluation of the pattern of grazing use within a pasture prior to or at the time the use check is made.
2. Identifying and locating the key area(s) to serve as practical units from which to determine grazing use within the pasture.

c. Characteristics of a key species

1. It usually will have a relatively high grazing preference by the kind of animal grazing the pasture for the season of use concerned as compared with other associated plant species within the key grazing area. Plants which may be very palatable but which have negligible production potential for the site should not be selected as key species.
2. It generally will provide more than 15 percent of the readily available forage within the key grazing area. When the range management objective is based on the increase of species which currently provide less than 15 percent of the available forage but which have the potential for a significant increase in production, the current stocking guide should be based on the proper use of this species. Because such a practice would necessitate a low stocking rate, an operator may plan and apply additional improvement measures to hasten the increase of desired species.
3. It generally will be a decreaser or increaser species, depending on the range management objective. In most instances where maintenance of high range condition or improvement in condition class is the range management objective, decreaser species with a high potential for forage production should be encouraged.
4. It will be an invader species only under special situations such as:
 - (a) When a pasture currently has a relatively pure stand of invader plants.
 - (b) When a pasture currently has a mixture of invader plants with good forage value and increaser species are not accessible to grazing animals.

- (c) When management based on the grazing use of such plants will not result in deterioration of soil and water conservation values.

5. It will be a perennial except for:

- (a) Rangelands which are specifically managed for the perpetuation use of annual vegetation.
- (b) Pastures currently having only annual species or a mixture of annuals with good forage value and perennial species of little or no grazing value.

d. Selecting key species on which to judge use

1. Within the key grazing area, the degree of use is determined for designated key species only--not for all plants in the community.
2. The degree of use of these key species serves as the measure of use for the whole plant community within the key grazing area.
3. If the key species are correctly selected and are not overgrazed, the key grazing area should be properly grazed.
4. When grazing use of a pasture is by only one species of animal, a single plant species usually will suffice as the key species for judging the degree of use within a key grazing area.

5.113 Defining proper degree of grazing use for key species on key areas.

- a. Specifications for the degree of use of native plant species should be based on the best locally adapted research data and on local field experience.

In general, research and experience indicate that most native range plants remain vigorous and productive when not more than about 40 to 50 percent of the current production by weight is used during the growing season. The percent of allowable use varies by species. The degree of use that native species can tolerate is somewhat higher during the dormant period. However, dormant period stocking rates should not always be increased because variable amounts of the forage disappears as a result of weathering, trampling, and other causes. Reduction in grazing use may be needed on sites with steep slopes and unstable soils.

- b. When grazing is limited to the dormant season, use generally should not exceed 60 percent of the current year's growth for key perennial grass and key forb species or over 65 percent of the current growth of twigs and leaves for key browse species within reach of game animals. The degree of use as specified for deciduous browse species during the dormant season is based on current twig growth only.
- c. The degree of use within a pasture will be expressed as the percent removal by weight of the key species within the key grazing area or areas of the pasture. Estimated percent removal is based on total yield for the growing season.

5.113 Continued

- d. Specifications for range proper use, including the selection of key grazing areas and key species, need to be developed for each kind of animal. When the grazing use of a pasture is predominantly by one kind of animal and the use by other kinds of grazing animals is negligible, base the specifications of range proper use on the predominant kind of grazing use.
- e. When the key grazing area(s) is correctly identified and key species are grazed within the limits of proper use, the pasture as a whole is considered to be properly grazed.
- f. The degree of use will be expressed in pounds of current year's growth left as residue on annual ranges in the Mediterranean-type climate zone.
- g. Exhibit 10 illustrates the Planning and Application Record For Proper Grazing Use.

5.114 Methods for determining utilization by key species.

- a. Weight comparisons of grazed versus ungrazed plants:

Cut and weigh ungrazed plants of the key species in movable enclosures and compare their weights with that of grazed plants of the key species in the vicinity of the enclosures. Such enclosures should be placed in the key grazing areas of pastures at the beginning of the grazing season. Or, compare the clipped or estimated weight of ungrazed plants and of grazed plants of the key species selected at random within the key grazing area. (If no ungrazed plants of the species are encountered, use ungrazed plants from the nearest comparable location.)

- b. Percent grazed versus ungrazed plants:

This method is applicable where local evaluations have been made relating the percent of grazed versus ungrazed plants of a species to percent removal by weight. After determining the percent of grazed versus ungrazed plants of the key species within the key grazing area, the percent removal is determined from charts and graphs developed from previous evaluations.

- c. Ocular estimates of percent grazed:

Well qualified technicians who are trained and experienced in making actual weight comparisons of grazed versus ungrazed plants can make ocular estimates of the percent removal of key species within key grazing areas. When this method is used, it is important to demonstrate actual weight comparison methods to the rangeland operator in one or more pastures.

- d. Determining utilization of browse plants:

Practical field methods of determining the degree of use have been developed for grass and forbs, but for the present a check list is used to evaluate utilization and the condition of browse plants. A guide for this purpose is included as Exhibit 11 in the Appendix.

5.115 Other considerations in determining utilization.

- a. Although the degree of use or lack of use of each plant species within a pasture is of interest and affects the nature of the plant communities within the pasture, it is neither practical nor essential to determine the use of each species.
 1. Averaging the degree of use of a number of species having widely different degrees of use and grazing preference values does not provide a meaningful answer to range utilization or to the impact of such utilization on the plant community.
 2. Non-use or light use of a species of negligible grazing preference does not compensate for heavy use of a species with high grazing preference.
 3. In order to determine the use status of a range, it is necessary to determine the acreage that is properly used and overused. The intent of the practice is to prevent excessive use or at least to reduce the acres having excessive use to a reasonable minimum. Most grazed pastures have small areas of natural livestock concentration, such as those immediately adjacent to water, which often are excessively used even when the pasture as a whole is lightly grazed. When such areas of excessive use do not exceed 10 percent of the pasture, the pasture may be considered properly used.
- b. The time to determine the degree of grazing use should be at or near the end of the grazing period.
 1. For pastures grazed on a continuous yearlong basis, the final determination should be made shortly before the beginning of a new growing season.
 2. On pastures grazed only in early spring, rested in summer, and grazed in fall, the degree of use should be determined at or near the end of each grazing period.
 3. Determinations of degree of use at or near the end of the grazing period serve to indicate the final utilization of pastures. However, they fail to provide guidance concerning the need for adjustments in stocking rates or other management changes during the current grazing season. This guidance may be needed due to variations in the amount of seasonal forage production. Conservationists should work with cooperators in assessing forage production and utilization trends well before the end of the grazing period, preferably before two-thirds of the grazing period is completed. Conservationists need to show cooperators how to evaluate degrees of forage use as the grazing period advances.
- c. When making periodic determinations of the degree of grazing use of key species, careful attention should be given to changes that may have occurred in plant composition and in range condition in pastures since the original plans were developed for range proper use. Such changes may necessitate selection of different key species and, in some cases, different key grazing areas.

5.116 Relationship of grazing distribution to utilization.

- a. Most pastures have inherent grazing distribution problems resulting from variations in topography, location of fences, and distances from salt and livestock water. In addition, many pastures include variable combinations of range sites and range condition classes on which utilization is seldom uniform.
- b. An evaluation of the zones or belts of varying degrees of use resulting from the above factors provide a valuable means for determining the need for measures that will aid in securing a more uniform and efficient distribution of grazing.

5.117 Degree of grazing use as related to flexible stocking rates.

- a. The attainment of a specific degree of use is not assured by the arbitrary assignment of a stocking rate at the beginning of a grazing period. This may be due to fluctuations in forage production or attritional loss of forage by means other than direct grazing use. If the specified degree of use is to be attained, stocking rates must be adjusted as forage production fluctuates.
- b. The suggested initial stocking rates that are in work unit technical guides are based on general averages for the individual range sites and range condition classes. These are without specific reference to the grazing distribution problems occurring in individual pastures. For example, a Stony Hills range site with relatively steep slopes adjacent to a relatively level Loamy Upland range site normally receives less grazing use than the Loamy Upland site. The Stony Hills range site may produce enough forage to permit a stocking rate of two acres per animal unit month when it is the only site within a pasture. However, its grazing use will generally be substantially less, under conditions just described, by the time the Loamy Upland range site has been properly used. Therefore, no initial stocking rates for a pasture should be based directly on the initial stocking rate guides without first making a careful on-site evaluation of factors affecting grazing use within the entire pasture.

5.118 Determining grazing utilization on grazable woodlands.

- a. Grazing use of grazable woodlands is planned in accordance with the standards and specifications of the Woodland Proper Grazing practice.
- b. Evaluation of grazing utilization is based on key areas and key plants within woodland fields. Key areas and key plants must be selected and grazing managed to protect both forage plants and desirable timber species from grazing damage.

5.12 Other plant management practices. In addition to Range Proper Use, the following practices are used in accordance with local specifications, needs of the land, and desires of the landowner:

- a. Deferred Grazing.
- b. Rotation Deferred Grazing.

5.20 Accelerating practices for speeding up range improvement

The following practices may be needed when plant management practices by themselves will not result in the range improvement within a reasonable time:

- a. Range seeding
- b. Brush control
- c. Contour furrowing
- d. Pitting
- e. Range renovation
- f. Controlled burning

5.30 Practices for controlling livestock

Livestock control is essential to manage rangeland and to achieve uniform grazing use. Dependable water supplies are indispensable, and fences and trails often are needed. The following practices must be carefully considered on each unit:

- a. Stock water developments
 - 1. Farm ponds
 - 2. Spring developments
 - 3. Wells
 - 4. Pipelines for livestock water
 - 5. Troughs and tanks
 - 6. Cattle walkways
 - 7. Stock trails
 - 8. Fencing

6.00 COST-RETURN PROCEDURES AND TOOLS

It is the policy of the Soil Conservation Service to provide livestock operators with cost-return information on alternative land uses and treatments of their soil, water, and plant resources.

6.10 Purpose of making cost-return analyses

The primary purpose of developing and using cost-return information is basically to achieve maintenance or improvement of resources with due regard to economic considerations.

- a. Cost-return information used for this purpose furnishes operators with an economic evaluation of range management practices.
- b. Assist operators make an economical evaluation of alternative uses and treatment of land; whereby they may make informed choices in planning and applying their conservation plan.
- c. Make operator and conservationist better aware of economic implications of practices and treatment offered for consideration, and improve economic soundness of conservation plans.
- d. Use as a tool to train conservationist to attain knowledge as to economical feasibility of selection of treatments or combination of treatments in development of conservation plan.
- e. Provide knowledge of economic benefits of conservation programs to enable governing bodies of soil and water conservation districts to evaluate their programs and plans more effectively.

6.20 When to use cost-return information

- a. Conservationist should develop and use cost-return information, where applicable, as an integral part of development of every conservation plan, revision of plans and servicing plans. The detail and time spent in use of cost-return information would depend on each situation.
- b. Normally, it will not be necessary to make a detailed cost-return analysis of every operation. However, conservationists should be trained and able to do so if the need arises.

6.30 Tools for collecting and using bench mark cost-return information

6.31 Form B - Livestock Production from Properly Used Forage Resources Under Conservation Treatment with Pertinent Livestock Costs.

This form has been developed by the Soil Conservation Service and approved by the Bureau of the Budget. It gives the Soil Conservation Service official approval to gather factual information on costs and returns from selected conservation operators who are willing to make their records available. Normally this type of information will be collected by a range conservationist or a competent work unit conservationist. (Exhibit 12)

It is not desirable to attempt to collect this information from registered herds. The collection of information from registered breeders becomes very complex and time consuming. Information collected from this type operation would not be applicable to normal livestock operation.

Sometimes ranchers hold over or sell off significantly more stock than is average for their operations. Therefore, in the year when Form B is completed with the rancher, the January inventory for that year may be significantly high or low. If so, an adjustment needs to be made. For example, if a rancher kept twenty heifers more than normal, rather than selling them, this is the same as if he had sold them to himself and his gross income should be increased by their value. But if he sold significantly more cows than normal, this should

6.31 Continued

be subtracted from his gross income since this is not a normal income from a herd represented by his January inventory. This procedure is called an inventory adjustment.

It is desirable to collect such data over a period of years to give comparisons between good and poor forage production due to climatic conditions.

Some key factors to look for are:

- a. Percent of calf or lamb and kid crops weaned.
- b. Sale weights by kind and class of livestock and livestock products.
- c. Livestock costs.
- d. Forage costs.
- e. Net return.

These factors offer a basis for comparing operations of similar resources and kinds of livestock under less desirable systems of management.

When several Forms B have been collected for similar types of operations within a given land resource area, the data should be summarized and placed in Section V-B of the Work Unit Technical Guide. When this is done, it becomes benchmark data. (Exhibit 13)

- 6.32 Amortization. Amortization as used by SCS in cost-return estimates means paying a financial obligation or investment off in equal annual installments (principal plus interest) at a given rate of interest for a given period of years. This is a means of reducing lump sum capital improvements to an annual cost basis. To get total annual costs, annual maintenance must be added.

The period of amortization should never exceed the life of the measure or structure. If money is borrowed to make the improvement, the length of the loan determines the period of amortization. Or, if the operator has the money, the real or potential alternative uses of capital will determine the period of amortization. Generally speaking, the cooperator will want to amortize his investment in the shortest time possible consistent with benefits received. The proper interest rate to use is the going rate charged by the local lending institutions.

The amortization factors given in the following table are for given rates of interest for given periods of time to retire a debt of \$1.00. Example: An operator borrows money to build a stock pond costing \$465.00. He borrows this money for five years at five percent interest. Solution: $465 \times .23097 = \$107.40$ (the required annual payment).

6.32 Continued

Number of Years	4 Percent Interest	5 Percent Interest	6 Percent Interest	7 Percent Interest	8 Percent Interest
1	1.04000	1.05000	1.06000	1.07000	1.08000
2	.53020	.53780	.54544	.55309	.56076
3	.36035	.36721	.37411	.38105	.38803
4	.27549	.28201	.28859	.29522	.30192
5	.22463	.23097	.23740	.24389	.25045
6	.19076	.19702	.20336	.20979	.21631
7	.16661	.17282	.17914	.18555	.19207
8	.14853	.15472	.16104	.16746	.17401
9	.13449	.14069	.14702	.15348	.16007
10	.12329	.12950	.13588	.14237	.14902
11	.11415	.12039	.12679	.13335	.14007
12	.10655	.11283	.11928	.12590	.13269
13	.10014	.10646	.11296	.11965	.12652
14	.09467	.10102	.10758	.11434	.12129
15	.08994	.09634	.10296	.10979	.11682
16	.08582	.09227	.09895	.10585	.11297
17	.08220	.08870	.09544	.10242	.10962
18	.07899	.08555	.09236	.09941	.10670
19	.07614	.08275	.08962	.09675	.10412
20	.07358	.08024	.08718	.09439	.10185

6.33 Suitable useful-life periods. Suitable useful-life periods similar to the following should be developed for each locality for arriving at annual costs:

	<u>Years</u>
<u>Improvements:</u>	
Fences - steel post	20
- wood post	20
Cattle guards	20
Corrals and loading chutes	20
Scales	20
Squeeze chutes and tables	15
<u>Machinery:</u>	
Crawler - tractors	10
Wheel - tractors	10
Pickups - 1/2 and 3/4 ton	5 (estimate cost on mi/gal.)
Trucks - 1/2 ton and semi-stock	5 (estimate cost on mi/gal.)
Sprayer	10
Shop Equipment	15
Misc. tools (replacement over)	10 (10 percent)
Light plant	10
<u>Water facilities:</u>	
Pipe lines - plastic	15
- steel galv.	15
Tank - steel storage	20
Troughs - galv.	15
Windmills	10
Pump jacks	10
Gas engines	10
Spring development	20
Stock ponds	20
Wells	20
<u>Buildings:</u>	
Bunk house	20
Light plant building	20
Feed storage	20

6.40 General guidelines to be used in developing cost items when working with individuals or groups considering conservation alternatives during the planning or preplanning process

- a. Interest on Land. Do not include interest on investment in land and dwellings as costs of production.
- b. Cost of Operating Machinery. Use (a) budgets which take into account fixed and variable costs, or (b) custom rates for doing a particular type of work.
- c. Labor. Items of labor should include both hired and family labor at going rates. To the extent that family labor is involved, it represents labor income. Care should be taken not to duplicate labor charges to the care of livestock, fencing, pasture, production, etc.
- d. Costs of Establishing Permanent Type Practices.
 1. Establishment costs during the year of establishment of improved pasture should be amortized over the life expectancy of the stand, or for a reasonable period of years for permanent stands.
 2. Total annual costs. These amortized costs of establishment plus other annual maintenance costs make up total annual costs of improved pasture.
 3. Other practices that need to be installed to carry out a conservation program, such as new fences, ponds, fire lanes, roads, trails, irrigation systems, etc. Costs may be amortized over the estimated life of the practice or facility plus annual maintenance.
 4. Where permanent physical features such as fences, water facilities, etc., exist at the time cost-return information is developed, only an annual maintenance or repair cost should be used.
- e. Land Taxes and Leases. Land taxes or leases on land used to produce livestock are part of the cost of production and should be included in fixed costs.
- f. Interest on Investment in Livestock. Charge interest on all livestock, except calves that will be sold at weaning time. Use purchase price or replacement value.
- g. Feed Costs.
 1. Purchased feed. Use cost of feed delivered to the farm or ranch.
 2. Feed produced on the farm or ranch. Use cost of production for feed used by livestock.
- h. Marketing and Transportation. Use actual costs where available, or use the standard sales barn commission rates. Trailer trucks equipped to haul livestock charge by the mile. Compute rate times distance.
- i. Taxes on Livestock. Show as a cost if taxes are paid. Some States do not tax livestock.
- j. Veterinary, Mineral, Salt, etc. Use actual cost, or average cost for the particular locale.
- k. Miscellaneous Cost. Such items as insurance, telephone, etc., could be lumped into this category.
- l. Livestock Sales. Use actual sale weights and prices of livestock sold if available. If not available, use average market prices for the various grades and classes.

6.50 Using cost-return to evaluate proposed alternative land use changes and treatment

6.51 Working with individual operators. A cost-return evaluation should be made as needed during the planning process. This evaluation should first include an analysis of the present operations. After this has been accomplished, an evaluation of appropriate land use and treatment alternatives should be made and substituted in part, or as a whole, in the initial evaluation to help the landowner decide upon the program best suited to his operation. Figures used to project livestock and forage production of proposed changes in land use and treatment should be the bench mark data that has been collected from operations of similar size, soil suitability, forage condition, and class of livestock.

Use comparative prices for the same quality of livestock in computing expected income from projected alternative land treatment programs.

In considering certain practices or alternative land treatments, where hazards and risks are involved, the operator should be appraised of them and proper consideration given in making the cost-return analysis for comparison to other alternatives with less risk and hazards involved.

By comparing the projected program with the present program, the difference can be attributed to the benefit of the proposed change or changes in land use and/or treatment(s).

6.52 Working with groups of operators. The same procedure used with individuals can be used with groups of operators as a pre-planning process. It has been used effectively for this purpose. Good judgment should be exercised when inviting operators to participate in cost-return studies as a group. Only operators who have similar-type operations, with similar problems, and who will participate freely should be invited. (Exhibit 14)

It is best not to use any particular member's operation, but to assume a typical situation for the locality. Keep in mind always the feelings of people, and that the purpose of a group meeting is to stimulate thought and not for decision-making. Decisions are made when the technician works with the individual operator on his farm or ranch.

7.00 LIVESTOCK MANAGEMENT IN A CONSERVATION PROGRAM

Successful conservation and efficient use of range plant resources depends on effectively coordinating range management, livestock management, and the use of good quality livestock. Conservationists should become familiar with livestock management principles and systems best suited to local conditions as they relate to conservation.

7.10 Keeping livestock numbers in balance with forage production

Proper use of the forage resources is the basis of every conservation plan developed for livestock operating units because of its importance in improving or maintaining conditions on range, grazable woodlands, and pastures.

Climatic conditions are seldom the same two years in succession. Annual fluctuation in forage production is a normal thing. To keep from overusing the forage resources produced in low production years and still fully utilize forage produced in high production years seasonal adjustments must be made in livestock numbers. In order for an operator to make these necessary adjustments, without undue hardship, he must have flexibility in his operations.

7.11 How to have a flexible livestock operation. Flexibility in the livestock and forage and feed program is most desirable for keeping livestock in balance with forage production. This is particularly true in locations having significant climatic variations from year to year. Flexibility can be achieved more easily when:

- a. A combination of pastureland, rangelands and other grazing lands are available in the operating unit.
- b. A portion of the livestock herd is maintained as steers or other stock which can be increased, adjusted, or liquidated on relatively short notice, meanwhile maintaining the base herd. It usually is considered advisable to hold the breeding herd at about 65-75% of the total animals. The other 25-35% should be maintained in livestock which lend themselves to more flexible marketing.
- c. The breeding herd should be kept below the average stocking rate of the previous five years or longer if stocking records are available. How much below the average will depend on how much production has deviated from the average.

7.12 How to balance livestock numbers with forage supply in low production years to keep from overutilizing the forage resource.

- a. Improve grazing distribution where practical, to improve efficiency of use of present grazing lands.
- b. Sell all dry stock, yearling steers and wethers early in the season, or as soon as a dry season is indicated.
- c. Cull breeding herd early in the season. Sell dry cows, slow breeders, poor milkers, and older animals. The best time is about the end of the normal spring growing season when animals are in good flesh.
- d. Purchase additional forage.
- e. Use supplemental or temporary pastures. However, unless irrigation water is available, these pastures suffer more in dry periods than does range.
- f. Maintain a supply of emergency feed on hand in form of hay or silage.
- g. Stocking on range should normally be such that in most years there will be some pasture or pastures either not grazed or grazed lightly so that there will be sufficient old grass on the land to maintain livestock for a short period of time until adjustments can be made.

7.13 How to adjust livestock numbers to utilize excess forage production.

- a. Buy dry stock, such as steers, wethers, etc., for short-term gains.
- b. Hold calves, lambs, and kids for late markets and put more weight on each animal.
- c. Hold over more replacements, which gives greater opportunity for upgrading the breeding herd.
- d. Cut excess forage for hay or silage for use in years of low production.

7.14

Animal Unit Equivalents

Animal Classes	(1) A.U. <u>1/</u>	(2) A.U. <u>2/</u>	(3) A.U. <u>3/</u>	(4) A.U. <u>4/</u>	(5) A.U. <u>5/</u>	(6) A.U. <u>6/</u>
1. Cow - Dry	1.00				1.00	1.00
2. Cow with calf	1.30		1.00		1.40	1.30
3. Cow - Unbred						1.00
4. Cow - Cull						1.00
5. Bull-Mature	1.40		1.25		1.25	1.40
6. Bull-Yearling						0.67
7. Bull-Cull						1.40
8. Heifer-Nursing						1.00
9. Heifer-Unbred						0.67
10. Calf-Weaned			0.60		0.60	0.50
11. Calf-Suckling					0.40	0.25
12. Steer-1 yr. old	0.67		0.70		0.80	0.67
13. Steer-2 yr. old	0.85		0.90			0.85
14. Steer-3 yr. old	1.05					1.05
15. Heifer-1 yr. old						0.67
16. Heifer-2 yr. old						0.85
17. Heifer-3 yr. old						1.00
18. Horse-Grown	1.25		1.25		1.25	1.25
19. Ewe	0.20					0.20
20. Ewe with lamb	0.27		0.20	0.20		0.27
21. Ram			0.20			
22. Elk-Mature	0.65	0.53	0.70	0.67		0.65
23. Deer-White Tailed		0.13	0.14	0.22		
24. Deer-Mule	0.25	0.17	0.20	0.25		0.25
25. Buck						
26. Antelope		0.10		0.20		
27. Bison		1.00				
28. Sheep-Bighorn		0.18				
29. Goat-Mountain		0.14				
30. Goat-with kid			0.17	0.20		
31. Buck			0.17			
32. Heifer-Pregnant					1.00	1.00

- 1/ National Research Council - National Academy of Science
(Animal Unit Values - Estimates based on Feed Requirements)
- 2/ Stoddard and Smith
(Equivalent Live Weights - Cow = 1000 lbs.)
- 3/ Range Management Glossary, A.S.R.M., values commonly used.
- 4/ Noble's Allotment Analysis Handbook
(The Average Head of Cattle - 800 lbs.)
- 5/ Technical Committee - W-79.
- 6/ Ratios Used from Column (1), 1/

Normally figures in Column (3) are used. In some local situations more details such as figures in column (6) may be desirable.

7.20 Distribution of livestock for more uniform use of forage can be accomplished by several means

7.21 Using different kinds and classes of livestock. The use of different kinds and classes of livestock may be helpful in obtaining more uniform use of forage. An example, sheep and goats usually can graze steep rocky land more uniform than cattle.

7.22 Fencing. This is a positive way of controlling and confining livestock to certain areas. The number and size of pastures needed on any given operation will depend to a large extent on:

- a. The kinds and classes of livestock the operator has. For example, if an operator runs both sheep and cattle, or runs commercial and registered stock, he will generally need more pastures than if he ran only one kind and class of livestock.
- b. Size and shape and topography of the entire unit, and whether or not cropland is intermingled with the grazing resources.
- c. The number of sites and the condition class of each. It is much easier to apply proper management to the grazing resources if different plant communities can be managed separately because of the growth requirement of the vegetation.
- d. Animals will graze any pasture more uniformly if larger numbers are grazed for shorter periods of time. In many areas, livestock will harvest the forage efficiently and uniformly if there are enough animals in the pasture to harvest the forage within a three to four week period.
- e. The amount, location and dependability of livestock water supplies often influences the size and number of pastures. This is particularly true in regions where stockwater development is a major problem.

7.23 Livestock water facilities. Properly located, adequate, clean, and dependable water supplies are essential for good range management and sustained livestock production.

Generally, stock water is developed for a year-round supply. However, there are some opportunities for development of seasonal water supplies where this is the best opportunity available or where seasonal use of forage is desired.

In some locations, where the expense of a single water facility is excessive, or the source of water is limited, pipelines are used to secure the desired spacing of water. Spacing is less important in small pastures than in large ones. The following general guides may need local adaption:

a. "Rule-of-thumb" Guide for Spacing Water Facilities for

Cattle. (Based on 40-60 animal units per facility)

<u>Type of Terrain</u>	<u>Travel Distance, Feed to Water</u>
Rough	1/4 to 1/2 mile
Rolling	3/8 to 3/4 mile
Level	3/4 to 1 mile

b. General Livestock Water Requirements Per Day

Cows	10 gal.
Sheep	1/2 to 1 gal.
Goats	1/2 to 1 gal.
Horses	10-12 gal.

(Will vary by location, season, etc.)

7.24 Location of salt, mineral, and supplemental feeding. The planned location of salt and mineral facilities in properly-fenced and watered pastures can further encourage grazing distribution. These facilities should be placed in areas that need additional grazing to achieve proper use more uniformly over the entire pasture. The number of salting locations will depend on the size and topography of the pastures and the number and class of livestock being grazed.

a. The approximate number of cattle one salting location will adequately serve on different types of terrain is:

1. One for each 40 to 60 cattle grazing level to gently-rolling country.
2. One for each 20 to 25 cattle grazing rough country.
3. Salt locations should not be over $1/2$ to 1 mile apart on rough range, and not over $1\frac{1}{2}$ to 2 miles apart on gently-rolling range.

b. General salt requirements for grazing animals:

Cows	$1\frac{1}{2}$ - 3 lbs. per month
Horses	2 - $3\frac{1}{2}$ lbs. per month
Sheep	$\frac{1}{4}$ - $\frac{1}{2}$ lb. per month
Goats	$\frac{1}{4}$ - $\frac{1}{2}$ lb. per month
(Will vary by climatic areas, stage of vegetation growth, etc.)	

7.25 Herding. This is the most positive and effective method of getting livestock to graze where desired, but is also very costly. Herds should move to new locations often enough to prevent overuse of forage and unsanitary conditions.

7.26 Cattle walkways. The construction of cattle walkways on marsh ranges and range areas subject to overflow can be a means of encouraging better grazing distribution within a pasture. When water covers the marsh, cattle usually only graze those areas on or near firm ground. With the construction of walkways, many areas of firm marsh are made accessible to grazing.

7.27 Stock trails. In many areas of steep, rocky land, the construction of stock trails can be used to encourage better distribution of grazing by providing access to areas that have been isolated due to steep mountain slopes or natural barriers.

7.30 Supplementing forage that is deficient in nutrients. The sole purpose of supplemental feeding on rangelands is to overcome deficiencies in protein or other essential nutrients in the native forage.

a. Protein supplement.

1. On most ranges and grazable woodlands, dry standing forage does not constitute a balanced livestock diet.
2. The amount of protein supplement required per animal and per season varies tremendously. Generally $1\frac{1}{2}$ to $2\frac{1}{2}$ pounds of 41% protein supplement per 1,000 lb. cow are needed during critical periods.
3. Some methods of feeding protein supplement are:
 - (a) Mixing salt with cottonseed meal to control intake.
 - (b) Blending urea with molasses.
 - (c) Use of protein blocks.
 - (d) Range cubes.

7.30 Continued

b. Minerals

1. In some areas minerals such as phosphorous, calcium and trace elements may be needed.

7.40 Control of livestock pests.

Effective control of internal and external livestock pests and parasites is essential to efficient management and production.

7.50 Regulating the breeding season

- 7.51 Ewes and nannies are normally bred within a 60-day period (which is three heat periods). They should be bred to drop lambs and kids enough before grass green-up so the lambs and kids are big enough to use the increased milk produced and to take advantage of the grass.

Generally one buck or billy is enough for every 25 to 30 ewes and nannies for such lambing season.

- 7.52 Cows are often bred to calve within a 90 to 100 day period, somewhat before the normal grass green-up date.

Generally one sire is adequate for every 20 to 25 females where controlled breeding is practiced.

Some benefits of a controlled breeding season for cow-calf outfits that sell weaning calves:

- a. Calves are generally heavier at given age and are in better bloom at market time when they are old enough to forage throughout the entire growing season.
- b. Cows breed better when they are on green, succulent feed, a practice which could increase calving percentages. If green feed is not available, consideration should be given to adding Vitamin A to the diet.
- c. Cows have time to mend before they go onto winter pastures. The cow herd winters better with less care and supplemental feed, reducing the concentration of livestock on given areas which could result in overuse and damage to the forage.
- d. More uniform calves at market time, generally demanding better prices.

- 7.53 Some operations breed for two calving seasons - spring and fall. This practice permits fewer bulls and split marketing.

- 7.54 Factors to be considered in livestock breeding and selection. All livestock should be bred, raised, and performance-tested under the environmental conditions under which they are to be used. The following is a list of six characteristics which are considered to be essential in breeding and selection of animals for range and pasture conditions:

- a. Disposition
- b. Fertility
- c. Weight
- d. Confirmation
- e. Hardiness
- f. Milk production

8.00 DEVELOPING CONSERVATION PLANS WITH RANCHERS AND LIVESTOCK FARMERS

8.10 Objectives

The objectives of conservation planning with ranchers and livestock farmers are stated in Section 1, National Handbook for Conservation Planning.

The process of developing conservation plans with ranchers assists them to understand their range, grazable woodlands, native pastures and related resources which will aid them in applying sound conservation treatment to all their lands for a balanced operating unit.

Conservation of grazing lands consists of developing and maintaining a desirable cover of vegetation for various purposes. These include protecting the soil, making efficient use of available moisture, producing forage for livestock or game, enhancing watershed conditions, providing shade, ornamental, esthetic or screening facilities for recreationists.

Conservation plans for ranches and livestock farms when applied on the land benefit the individual rancher, his community, and the Nation. In addition, well-managed range and related grazing lands, as well as the livestock and wildlife that use these areas, make a major contribution to natural beauty.

8.20 Planning assistance procedures

Section 4 of the National Handbook for Conservation Planning treats the planning process comprehensively. Every conservationist should understand and put to use the steps outlined in that handbook. In addition, the following items amplify specific steps in relation to assisting ranchers.

8.21 Rancher participation in planning. The kinds of plants on the land and how well they grow depends largely upon how livestock and game are permitted to graze the forage produced. Applying a conservation plan necessarily involves the manipulation of grazing animals by the rancher to obtain the desired degree of use. Such manipulations must be based on thorough understanding and timely decisions by the rancher on how this can and will be done. Therefore, successful and effective conservation planning requires maximum participation by the rancher out on the land where he can see and discuss soil, water, plant and related resources with the conservationist and reach an adequate understanding of them.

8.22 Developing treatment alternatives. As various problems are recognized and identified, the conservationist should suggest alternatives for treatment. Suggestions should be made tactfully. A common error is to suggest treatment before the rancher fully recognizes the problem in which case he is often reluctant to accept the suggestions. The conservationist should be frank and businesslike. Avoid indefiniteness and "beating around the bush." If the problem has been properly recognized, the rancher will want suggestions on what to do.

For example:

<u>Problems</u>	<u>Alternative Solutions and Opportunities</u>
Heavy use of range plants, low vigor	Range proper use, deferments, grazing systems, supplemental grazing.
Erosion, poor condition	Range seeding, range proper use, deferment.
Brush and weeds	Brush and weed control, range proper use, deferment.
Livestock water	Ponds, wells, springs, pipelines, troughs, tanks.
Distribution of grazing	Waterings, riding, fencing, salting, feeding, access roads, trails, cattle walkways.

8.22 Continued

<u>Problems</u>	<u>Alternative Solutions and Opportunities</u>
Low production of forage in dry years	Adjustments in livestock numbers, buy or develop additional feed or forage. (See Sections 6.12, 6.13, 6.20.)

Once the various possible alternatives have been developed, they can then be considered from the standpoint of which one or ones seem best adapted to the rancher's particular needs and desires. Cost and return evaluations are particularly effective in this step, since they not only indicate what each alternative will cost, but what can be expected in return. (See Section 6.)

- 8.23 Planning for year-long forage and feed needs. An inventory of the average anticipated available feed and forage and an analysis of the amounts needed for the livestock are valuable for overall long-range planning of the operating unit. This will help indicate where and when shortages or surpluses might develop and can be helpful in planning the production of forage and feed to meet the specific need of the operating unit. Likewise, it can be useful in planning a livestock program best suited to the potentials and capabilities of the unit.

An example of a "Livestock, Forage and Feed" worksheet useful for this purpose is included as Exhibit 15 in the Appendix.

9.00 FOLLOWUP ASSISTANCE

9.10 Purpose of followup work

The necessity of continuing and systematic followup contacts between Service personnel and all cooperators cannot be over-emphasized. Such followup is particularly important in assisting in the application of range management practices. In doing followup work with cooperators, individually or in groups, full consideration must be given to their attitudes, resources, and desires.

9.20 Obtaining effective followup

Obtaining effective followup depends upon:

- a. District supervisors providing the needed leadership and participation.
- b. District cooperators being adequately informed about how they can use district's followup assistance to meet their needs.
- c. Service line officers giving sufficient attention to basic forage management practices, such as range proper use and deferred grazing, and grazing systems.
- d. Developing conservationists' confidence to work with cooperators on grazing management practices.

9.30 Analyzing need for followup assistance

- a. A check list of cooperators and a location map is helpful to record individual followup needs and contacts which will enable a conservationist to:
 1. Insure that contacts are directed at specific needs of cooperators and have a specific purpose.
 2. Make sure that all cooperators are contacted.
 3. Avoid unnecessary repeated contacts.
 4. Provide a basis for determining the most practical interval between followup contacts.
- b. Additional tools available for analyzing the need for followup assistance on rangelands include: Technician's Notes, 196's, SCS 68 & 69, and Analysis of Records and Reports.

9.40 Scheduling

9.41 Timing of followup. Followup should be scheduled at a time when there is the greatest need for assistance in applying management practices. This is especially true in working on range proper use during the grazing season to enable the cooperator to make timely adjustments.

9.42 Planning for followup. Followup assistance can be facilitated by:

- a. Providing for followup time in A.P.O.'s.
- b. Planning a full day's work in each work area each time conservationists visit it.
- c. Establishing specific appointments with cooperators.

9.50 Information obtained by SCS from followup contacts

- a. Data for progress reporting.
- b. Additional information on benefits of conservation treatment.
- c. Information for District Supervisors' use in evaluating district progress and needs.
- d. Information for district news columns and feature stories on range conservation.
- e. Actual use records on grazing lands.
- f. Recording decisions for conservation plan revision.

SAMPLE RANGE SITE DESCRIPTION

Land Resource Area Rolling Plains

Location _____

Date _____

1. RANGE SITE NAME: Sandyland2. CLIMATE:

- a. Average annual precipitation is 22 inches. Annual rainfall occurs mostly from May through October with each month receiving 2 inches or more. There are extreme fluctuations from year to year, with periodic drouths. Summer rainfall is characterized by torrential showers producing high runoff from unprotected soils. Winter precipitation averages less than an inch per month and comes in the form of snow and/or rain.
- b. Wind velocities are high in this area in comparison to the rest of the United States. High wind during March and April causes much erosion on unprotected areas.
- c. The growing season of the native warm-season plants begins after the last frost, April 10 to April 21, and continues as moisture is available until October 29, which is the average date ending the frost free period. Winters are characterized by frequent northers (wind) producing severe cold with a recorded low of -16 degrees; the maximum summer temperature on record is 108 degrees Fahrenheit. Summer humidity is low and evaporation high.

3. TOPOGRAPHY AND ELEVATION:

This site occurs on gently to moderately hummocky land in all sandy areas.

4. SOILS:

- a. The soils associated with this site are loamy fine sands, loamy sand, and fine sand, that are 20 inches deep or more to parent material. These soils are moderately rapid to rapidly permeable. If unprotected by vegetation, the soil is highly susceptible to wind erosion. If vegetation covers this soil, the moisture intake rate is high, little runoff occurs, and more water is available for plant growth.

EXHIBIT - 1-Continued

- b. The soils in this site may include one or more of the following soil taxonomic units:

Enterprise loamy fine sand

Pratt loamy fine sand

Likes loamy fine sand

Springer loamy fine sand

Miles loamy fine sand (deep phase)

Miles loamy fine sand

- c. Complete Soil Series Descriptions are available in the Soil Survey Descriptive Legend.

5. CLIMAX VEGETATION:

The climax plant community is dominated by tall and mid grasses. Short grasses are of minor importance. Climax forbs are relatively common. Shrubs normally comprise less than 10 percent of the total plant cover. Principal decreaser and increaser species are:

Decreasers

Little bluestem
Sand bluestem
Indiangrass
Switchgrass
Needle and thread
Texas blue grass
Sand lovegrass
Decreaser forbs

Increasers

Blue grama
Sideoats grama
Silver bluestem
Hairy grama
Threeawns
Sand dropseed
Sand sagebrush
Shinnery oak
Small soapweed
Sand plum
Skunk brush
Increaser forbs

The decreaseers make up about 40 percent of the vegetation (35% tall-5% mid) and the remainder is increasers.

Approximate total annual yield of this site in excellent range condition in normal years is 4,000 pounds per acre air-dry, but varies from 1,500 pounds in less favorable to 5,100 pounds in favorable years.

6. SPECIFIC SITE LOCATION, ETC.:

SW 1/4, T 16N, R 21W, east side of State Highway 50. Plains county.
(Designate soil taxonomic unit if known.)

SAMPLE RANGE CONDITION GUIDE FOR AN INDIVIDUAL RANGE SITE

Range Site Name _____ LRA _____

Major Soils _____ SCD _____

_____ Date Prepared _____

DECREASER PLANTS (Count all found to determine condition)	INCREASER PLANTS (Count no more than shown)	Composition Percent	INVADER PLANTS & ANNUALS (Count none)
Idaho fescue	Sandberg bluegrass	10	Cheatgrass
Bluebunch wheatgrass	Woolgrass	4	Pacific fescue
Prairie junegrass	Squirreltail	1	Mustard
Big bluegrass	Thurber's needlegrass	1	Tarweed
Basin wildrye	Balsamroot	1	Thistle
Hawksbeard	Yarrow	1	China lettuce
	Lupine	1	
	Astragalus	1	
	Phlox	1	
	Biscuitroot	1	
	Big sagebrush	2	
	Threetip sagebrush	1	
	Rabbitbrush	1	
	Sumac	1	

SAMPLE RANGE CONDITION GUIDE FOR AN INDIVIDUAL SITE WITH YIELD
RATING INDEX FOR DECREASERS

RANGE SITE _____ IRA _____

LOCATION _____ Prepared by _____ Date _____

DECREASERS	YIELD RATING	INCREASERS	Per- cent	INVADERS
Little bluestem	(2)	Tall dropseed	5	Buffalo grass
Big bluestem	(3)	Side oats grama	10	Prairie threeawn
Indiangrass	(4)	Low panic grasses	5	Annual forbs
Switchgrass	(4)	Sedges	3	
Per. sunflowers	(4)	Pussytoes	3	
Compass plant	(5)	Aster	3	
Lespedeza spp	(5)	Other Increaser forbs	5	
Leadplant amorpha	(5)	Coralberry	5	
		Other woody Increasers	3	

Presence Rating Index for Decreaser Species

- (1) - Always present, more than 50 percent of total annual yield.
- (2) - Always present, 25 to 49 percent of total annual yield.
- (3) - Generally present, 10 to 24 percent of total annual yield.
- (4) - Frequently present, less than 10 percent of total annual yield.
- (5) - Occasionally present, less than 5 percent of total annual yield.

NOTE: Rating index legend usually shown on a single separate legend sheet rather than on each guide.

SAMPLE SPREAD SHEET GUIDE TO RANGE SITES AND RANGE CONDITION
WITH STARTING STOCKING RATES

WORK UNIT _____ Date Prepared _____

Key Climax Plants and Others that Invade with Overgrazing								
Key Climax Plants	Percent Allowable by Sites*							Invading Plants
	1	2	3	4	5	6	7	
Little bluestem	-	-	-	-	-	-	-	All annuals
Big bluestem	-	-	-	-	-	-	-	Windmill grasses
Indiangrass	-	-	-	-	-	-	-	Hairy tridens
Switchgrass	-	-	-	-	-	-	-	Texas grama
Canada wildrye	-	-	-	-	-	-	-	Tumblegrass
Western Wheatgrass			15					Red grama
Sideoats grama	20	10	10	-	25	5	INV	Silver bluestem
Blue grama		5	5	-	10		INV	Splitbeard bluestem
Hairy grama	10	5	INV	5	INV	5	INV	Weak lovegrasses
Texas wintergrass	5	5	5	5	5	5		Low panicums
Buffalograss	INV	5	INV	15	5	INV	INV	Low paspalums
White tridens		INV	INV	5	INV	INV		Sand dropseed
Vine mesquite	INV	5	5	15	5	5		Threeawns
Tall dropseeds	10	10	10	-	15	10	5	Ragweed
Purpletop	-	-	10		-	10	15	Mesquite
Sand lovegrass	-	-	-	-	-	-	-	Cactus
Woody plants	5	5	10	INV	INV	10	10	

Total Percent								
Increasers in climax	30	30	25	40	25	30	20	

Range Condition	Initial Stocking Rates by Sites - Ac/Au.							Percent Climax Vegetation
	20-25	10-13	7-10	16-20	10-14	13-17	15-20	
Excellent	20-25	10-13	7-10	16-20	10-14	13-17	15-20	76-100
Good	25-30	13-17	10-14	20-25	14-21	17-21	20-25	51-75
Fair	30-40	17-21	14-20	25-35	21-30	21-30	25-35	26-50
Poor	40+	21+	20+	35+	30+	30+	35+	0-25

*Site Descriptions (Site name, Soil Units)

Site 1 - Name -	Soils -
Site 2 - Name -	Soils -
Site 3 - Name -	Soils -
Site 4 - Name -	Soils -
Site 5 - Name -	Soils -
Site 6 - Name -	Soils -
Site 7 - Name -	Soils -

Legend

Blank = Not important 5,10, etc. = Increaser; percent found
 - = Decreaser, all allowed in climax
 INV = Invader on the site

GUIDE FOR DETERMINING RANGE CONDITION

Part 1. Key Species and Their Response to Grazing as Judged from Climax

WL - Wet Land	SyL - Sandy Lowland	Sy - Sandy	LiU - Limy Upland
Sb - Subirrigated	SiL - Silty Lowland	Si - Silty	SwG - Shallow to Gravel
SS - Saline Subirrigated	SL - Saline Lowland	Cy - Clayey	SwL - Shallow Limy
SiO - Silty Overflow	Sa - Sands	CS - Choppy Sands	TL - Thin Loess
CyO - Clayey Overflow			

Relative Importance by Range Site^{1/}

Decreasers	WL	Sb	SS	SiO	CyO	SyL	SiL	SL	Sa	Sy	Si	Cy	CS	LiU	SwG	SwL	TL
Alkali cordgrass	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkali sacaton	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-
Big bluestem	-	1	-	1	3	-	1	-	-	-	3	4	-	4	4	4	4
Blowoutgrass	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-
Canada wildrye	-	4	4	4	5	5	4	5	5	5	4	5	-	5	-	5	5
Indiangrass	-	3	3	4	4	4	4	4	4	4	4	4	4	4	-	5	5
Plains muhly	-	-	-	-	-	-	5	-	-	-	5	5	-	5	5	5	5
Porcupinegrass	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-
Prairie cordgrass	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prairie dropseed	-	-	-	-	-	-	5	-	-	-	5	4	-	-	-	5	5
Prairie junegrass	-	-	-	5	-	5	5	-	5	5	5	5	5	5	5	5	5
Reed canarygrass	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reedgrasses	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand bluestem	-	-	-	-	-	2	-	-	1	2	-	-	1	-	4	-	-
Sand lovegrass	-	-	-	-	-	-	-	-	4	5	-	-	3	-	-	-	-
Switchgrass	-	3	2	3	4	3	3	3	3	4	3	4	3	4	4	5	5
Forb decreaseers	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Woody decreaseers	-	-	-	-	-	5	5	-	4	4	5	-	4	5	4	5	5

Maximum Percentages in Climax by Range Site^{2/}

Increasesers	WL	Sb	SS	SiO	CyO	SyL	SiL	SL	Sa	Sy	Si	Cy	CS	LiU	SwG	SwL	TL
Blue-Hairy grama	-	-	-	-	10	5	10	-	5	10	15	20	5	15	20	20	20
Buffalograss	-	-	-	-	5	-	-	-	-	-	5	10	-	5	-	-	-
Gray sageworts	-	-	-	-	-	5	5	-	5	5	5	-	-	-	5	-	-
Green muhly	-	5	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Inland saltgrass	-	-	10	-	-	-	-	20	-	-	-	-	-	-	-	-	-
Little bluestem	-	d(3)	-	d(3)	d(4)	d(2)	d(3)	-	25	d(2)	d(3)	d(3)	30	d(1)	d(3)	d(1)	d(1)
Needle and thread	-	-	-	-	-	d(3)	d(4)	-	10	d(3)	d(4)	-	-	10	d(4)	-	d(4)
Prairie sandreed	-	-	-	-	-	20	-	-	20	25	-	-	20	-	d(4)	-	-
Rosette panicums	-	-	-	-	-	5	-	-	5	5	-	-	5	-	-	-	-
Sand dropseed	-	-	-	-	-	5	5	-	5	5	5	-	5	5	5	5	5
Sand paspalum	-	-	-	-	-	-	-	-	5	5	-	-	5	-	-	-	-
Sandhill muhly	-	-	-	-	-	-	-	-	5	-	-	-	5	-	-	-	-
Sedge Family	25	15	5	5	5	10	5	5	5	5	5	5	5	5	5	-	5
Sideoats grama	-	-	-	10	5	-	10	-	-	d(4)	15	d(4)	-	25	d(3)	d(3)	d(3)
Tall dropseed	-	-	-	-	-	-	5	-	-	5	5	5	-	5	-	-	-
Western wheatgrass	-	5	d(3)	20	15	10	20	d(3)	-	15	15	25	-	10	10	-	15
Forb increasers	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Woody increasers	-	-	-	5	5	5	5	5	10	5	5	5	10	5	5	5	5

SAMPLE WORKSHEET FOR DETERMINING RANGE CONDITION

SITE _____ LOCATION _____

OPERATING UNIT _____ PASTURE NO. _____

EXAMINER _____ DATE _____

Species	Maximum Percent Normally Found in Climax	Present Percent Composition	Percent of Present Composition Counted Toward Climax
DECREASERS:			
Sand Bluestem	{ approximately 55 percent in total	5	5
Little bluestem		15	15
Switchgrass		10	10
Prairie clover		T	
INCREASERS:			
Blue grama	25	40	25
Sand dropseed	10	5	5
Hairy Aster	5	T	
Purple loco	5	10	5
Yucca	5	10	5
INVADERS:			
Annuals	{ none	5	0
Cactus		T	
Percent Composition	XXX	100	70
Condition Class Rating	XXX	XXX	Good

SAMPLE GRAZING GUIDE FOR GRAZABLE WOODLAND

Woodland Suitability Group: Group 2 plm

Location: _____ Date Prepared: _____

A. Nature of the Plant Community:

This is a ponderosa pine forest community. In moderately stocked mixed age class stands, the tree canopy is approximately 30 to 40 percent. The understory is dominantly grasses. Forbs comprise less than 15 percent of the understory yield. Shrubs, primarily mountain mahogany, occur as scattered individuals. The most abundant grasses are mountain muhly and Arizona fescue. Pine dropseed and Parry oatgrass are moderately abundant. Herbaceous species composition is similar for clear-cut and open canopy conditions, but herbaceous productivity is much greater. Productivity of the understory is extremely low under densely stocked sapling and pole-size stands, and in older age classes when the canopy exceeds 60 percent.

On areas subjected to excessive grazing use for a period of years, the understory generally consists of a mixture of blue grama, fringed sage, pinque, and slimstem muhly.

B. Relative Value of Species of Understory (for cattle)

<u>HIGH^{1/}</u>	<u>MODERATE^{2/}</u>	<u>LOW^{3/}</u>	<u>SLIGHT TO NONE^{3/}</u>
Mountain muhly	Arizona fescue	Slimstem muhly	Pinque
Parry oatgrass	Pine dropseed	Penstomen	Ninebark
American vetch	Western wheatgrass	Clematis	Groundsel
Hawksbeard	Blue grama	Golden pea	Pussytoes
	Sedge	Cinquefoil	
	Peavine	Milkvetch	
	Mountain mahogany		

C. Suggested Initial Stocking Rates

FORAGE QUALITY	TOTAL YIELD OF FORAGE SPECIES	CANOPY CLASS			
		OPEN	SPARCE	MEDIUM	DENSE
High	1600-2200	1.5	2.5	4.0	8.0
Moderately high	1200-1800	2.0	3.0	5.5	10.0
Moderate	700-1200	3.0	4.5	7.0	16.0
Low	175- 700	5.5	6.5	8.5	20.0+

1/ These species generally decrease under heavy grazing use.

2/ These species may temporarily increase but then decrease with heavy grazing use.

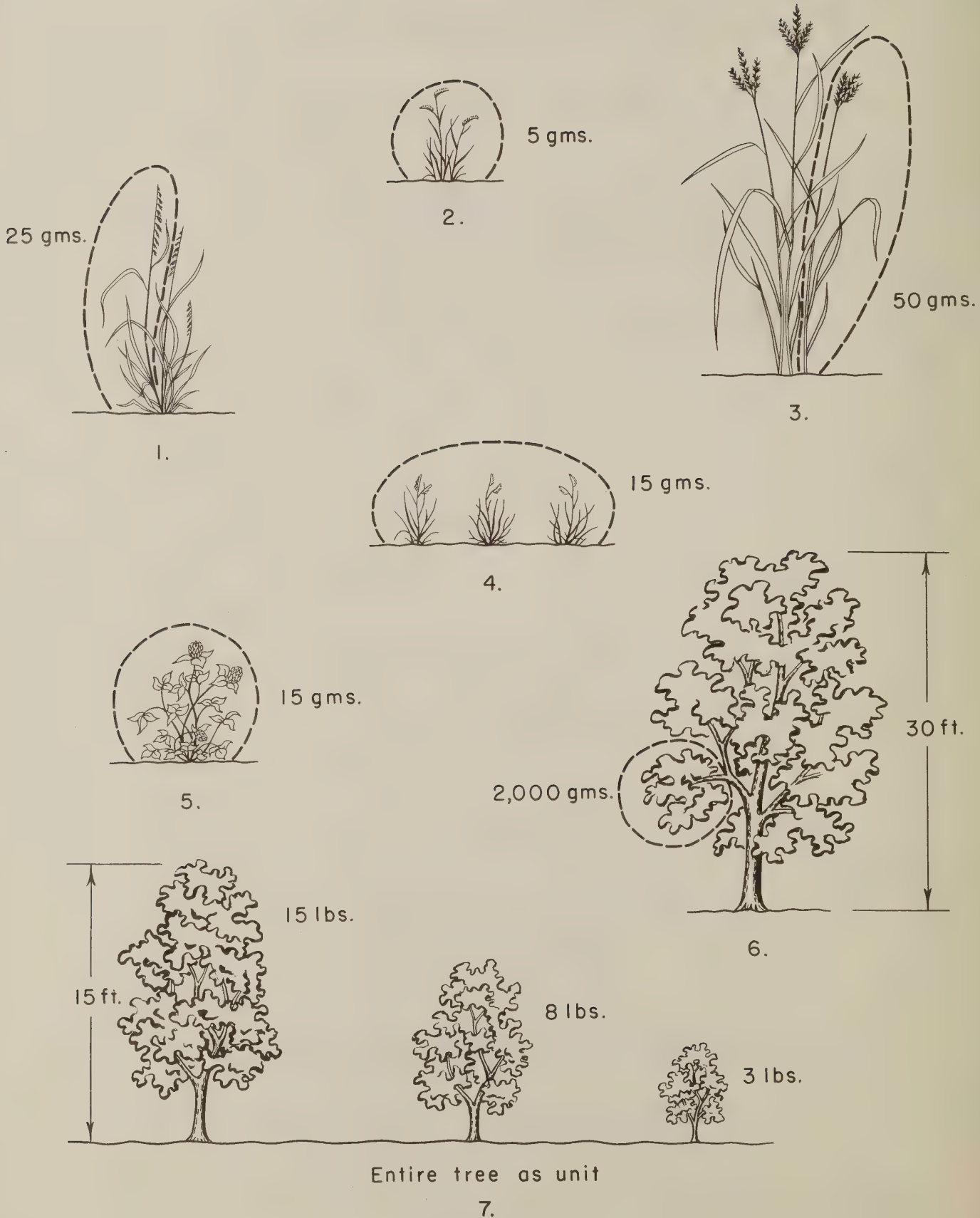
3/ These species continue to increase with heavy grazing use.

FOLIAGE AND FRUIT YIELD PER JUNIPER TREE ON DIFFERENT SITES
FOR DIFFERENT FOLIAGE CLASSES

Crown Diameter Ft.	Upland Loam			Upland Stony Loam			Upland Gravelly Loam			Upland Shallow Loam			Upland Shallow Hardpan		
	S	M	D	S	M	D	S	M	D	S	M	D	S	M	D
1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2
2	0.2	0.3	0.4	0.4	0.3	0.5	0.4	0.4	0.5	0.2	0.2	0.5	0.3	0.4	0.6
3	0.4	0.6	0.9	0.7	0.6	0.7	0.6	0.7	0.9	0.4	0.5	1.0	0.7	0.9	1.4
4	0.6	1.1	1.5	1.0	1.0	1.2	1.0	1.1	1.5	0.7	0.8	1.6	1.2	1.6	2.4
5	0.9	1.6	2.1	1.3	1.4	1.9	1.3	1.6	2.1	1.0	1.3	2.2	1.8	2.6	3.8
6	1.3	2.1	3.1	1.6	1.9	2.7	1.7	2.1	2.7	1.4	1.8	2.9	2.7	3.7	5.4
7	1.6	2.8	4.0	1.9	2.5	3.6	2.1	2.6	3.5	1.7	2.4	3.8	3.6	5.0	7.4
8	2.0	3.5	5.1	2.3	3.1	4.7	2.6	3.2	4.3	2.2	3.1	4.6	4.7	6.5	9.6
9	2.5	4.3	6.3	2.6	3.8	5.9	3.1	3.9	5.1	2.6	3.8	5.6	6.0	8.2	12.2
10	3.0	5.2	7.6	2.9	4.6	7.2	3.6	4.6	6.0	3.1	4.6	6.6	7.4	10.1	15.1
11	3.5	6.2	9.0	3.3	5.4	8.6	4.1	5.3	7.0	3.6	5.5	7.6	9.0	12.1	18.2
12	4.0	7.2	10.5	3.6	6.2	10.2	4.7	6.1	8.0	4.2	6.5	8.8	10.7	14.4	21.7
13	4.6	8.3	12.1	4.0	7.2	11.9	5.2	6.9	9.1	4.7	7.6	9.9	12.6	16.9	25.5
14	5.2	9.4	13.9	4.4	8.1	13.7	5.8	7.8	10.2	5.3	8.7	11.2	14.6	19.5	29.6
15	5.9	10.6	15.6	4.7	9.1	15.6	6.5	8.7	11.3	6.0	9.9	12.4	16.7	22.4	33.9
16	6.5	11.9	17.5	5.1	10.2	17.7	7.1	9.6	12.5	6.6	11.1	13.8	19.0	25.5	38.6
17	7.2	13.2	19.4	5.5	11.3	19.9	7.8	10.5	13.7	7.3	12.4	15.1	21.5	28.7	43.6
18	8.0	14.6	21.5	5.8	12.4	22.2	8.4	11.5	15.0	8.0	13.8	16.6	24.1	32.1	48.9
19	8.7	16.1	23.7	6.2	13.6	24.6	9.1	12.5	16.3	8.7	15.3	18.0	26.9	35.5	54.5
20	9.5	17.6	26.0	6.6	14.8	27.2	9.8	13.6	17.6	9.5	16.8	19.6	29.8	39.5	60.4

S = Sparse M = Medium D = Dense

EXHIBIT - 9



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service

PLANNING AND APPLICATION RECORD FOR GRAZING USE PRACTICES ON RANGE, GRAZABLE WOODLAND, AND NATIVE PASTURES

Cooperator_

[illegible]

Name and Date

JUDGING UTILIZATION, TREND, AND CONDITION OF BROWSE PLANTS

Name of Ranch _____ Location _____
 Range Site(s) _____ Date _____ Examiner _____

UTILIZATION OF CURRENT GROWTH

Key Grazing Area	Key Species	Season of Use	Percent Use of Key Species

CHECKING TREND AND CONDITION OF BROWSE PLANTS

	Key Species			Low Quality Species		
<u>Evidences of Past Year's Use</u>						
<u>Hedging (check one)</u>						
Not evident						
Moderate						
Severe						
<u>Browse line (check one)</u>						
Not evident						
Moderate						
Very apparent						
<u>Reproduction</u>						
<u>For key species (check one)</u>						
Adequate				xxx	xxx	xxx
Some but inadequate					xxx	xxx
Little or none					xxx	xxx
<u>For low quality species (check one)</u>						
Excessive	xxx		xxx			
Adequate	xxx		xxx			
Little or none	xxx		xxx			

Report as "Proper Use" if utilization of current growth of key species is not in excess of 50 percent or less by weight during growing season, or 65 percent during dormant season.

INSTRUCTIONS FOR JUDGING UTILIZATION OF BROWSE PLANTS1. CURRENT GROWTH.

- A. Utilization during the growing season. Proper use is when 50 percent by weight or less of the available twigs, leaves, and fruits have been removed during the growing season or 65% during the dormant season (twigs).
- B. Utilization during the dormant season. Proper use is when 65 percent or less of available twigs of deciduous species, or twigs and leaves of evergreen species have been removed.

(NOTE: These percentages should be used unless local research indicates otherwise. The above percentages are on the basis of weight of current year's growth as determined by ocular estimates or a combination of harvest and estimates.)

CHECKING TREND AND CONDITION OF BROWSE PLANTS1. EVIDENCES OF PAST YEAR'S USE.

- A. Hedging. Three categories as follows:

Not evident	Little or no evidence of hedging of plants.
Moderate	Up to half of the plants plainly show evidence of hedging.
Severe	More than half of the plants plainly show evidence of hedging.

- B. Browse Line. Three categories as follows:

Not evident	No browse line distinguishable from a distance. Production on lower twigs similar to that of twigs beyond reach of animals.
Moderate	Browse line apparent from a distance but lower twigs still reasonably productive.
Very apparent	Browse line strikingly evident. Little or no production on twigs within reach of animals.

2. REPRODUCTION. Three categories as follows:

- A. For key species:

Adequate: Sufficient seedlings and young plants to maintain or increase status of species in the community.

Some but inadequate:

Some seedlings and young plants present but not enough to maintain status of species in the community.

Little or none: The species is not reproducing. Plants mostly mature or decadent. Few or no seedlings or young plants.

- B. For low quality species:

Excessive: More seedlings and young plants than required to maintain species in the community. Species obviously increasing.

Adequate: Sufficient seedlings and young plants to approximately maintain status of species in the community. Population static.

Little or none: Very few seedlings or young plants becoming established. Species is declining in the community.

Livestock Production from Properly Used Forage Resources under Conservation Treatment with Pertinent Associated Livestock Costs

I. IDENTIFICATION

Name of Producer	Address
Land Resource Area	Year of Record
COF	1962
Date Obtained	SCS Technician
1/29/63	
Total Acres in Operating Unit	
7463	

II. LAND AND FORAGE RESOURCES

[illegible]

Soil Conservation Service
Farm and Ranch Planning
October, 1963

Budget Bureau 40-R-3325
Approval expires Dec. 31, 1968

SCS-Range-7-67

Form B-Page 2

III. CONSERVATION TREATMENT APPLIED INCLUDING GRAZING SYSTEMS AND MANAGEMENTIV. LIVESTOCK PRODUCTION*BASIC LIVESTOCK INFORMATION

Total Number Animal Units	355		
Percent Calf Crop Weaned	75%		
Average Age at Weaning	6-7 mo.		
Average Weight at Weaning	350#		
Average Weight of Cull Cows	800#		
Average Weight of Cull Bulls	-		
Average Weight of Steers Bought	-		
Average Weight of Steers Sold	-		
Death Loss (kind and number)	3%		

Number and Kinds of Animals

Cows	300		
Heifers(replacements)	25		
Calves (replacements)	15		
Bulls	8		
Horses	4		
Steers	-		
Livestock purchased, kind	-		

Number of Animals Sold

Calves	200		
Cull Cows	20		
Cull Bulls			
Steers			

Pounds of Livestock Sold

Calves	70,000#		
Cull Cows	16,000#		
Cull Bulls			
Steers			

Gross Income from Livestock (Dollars)

Calves	(At 22 ¢ lb.)	15,400.	
Cull Bulls	(At ¢ lb.)		
Cull Cows	(At 12 ¢ lb.)	1,920.	
Steers	(At ¢ lb.)		

Gross income from Livestock	\$17,320		
-----------------------------	----------	--	--

* On sheep ranches insert ewes, lambs, rams,
wool, etc., or equivalent for goats.

SCS-Range-7-67

V. ANNUAL FIXED COSTS

	Year 19 <u>62</u> Dollars	Year _____ Dollars	Year _____ Dollars
Taxes on land and improvements	--		
Improvements, barns, sheds, etc.	--		
Fences, new			
Fences, old (including maintenance)	540.62		
Water developments, new	None		
Water developments, old	None		
Roads and fire lanes - walkways	--		
Tame pastures	100.00		
Conservation treatment	--		
Grazing leases	--		
Miscellaneous	--		
Subtotal	640.62		

VI. LIVESTOCK COSTS

a.	Supplemental Feed & Costs		
	Protein (____ lb. per day for ____ days) 10 tons 40% cake	630.00	
	Hay (____ lb. per day for ____ days) 7,000 bales	2400.00	
	Silage (____ lb. per day for ____ days) Bull food	100.00	
b.	Interest on Investment in Livestock		
	Cows @ \$ 37,500.00		
	Heifers @ \$ 5,100.00		
	Bulls @ \$ 2,400.00		
	Calves @ \$		
	Steers @ \$		
	Horses @ \$ total	2790.72	
c.	Labor	--	
d.	Veterinary Expenses	50.00	
e.	Miscellaneous Costs		
	Transportation and Marketing	966.00	
	Pickup and Other Equipment	100.00	
	Taxes on Livestock	--	
	Bull Replacement		
	Salt and Minerals	200.00	
f.	Other		
	Subtotal Livestock Costs	7146.72	

VII. SUMMARY

Gross Income - Sales	17320.00		
Less Annual Fixed Costs	640.62		
Less Livestock Costs	7146.72		
Ranch Net Return	9532.66		
Per A.U. Cost - Total Operation	20.50		
Per A.U. Net Return			
Total Operation	26.90		

Form B
Page 4

VIII. REMARKS AND MISCELLANEOUS DATA Woodland is uneven-aged, fully stocked
loblolly pine. Company who owns the land has applied considerable woodland
weeding.

IX. INSTRUCTIONS FOR COMPLETING FORM

1. Use form only on representative ranches where good livestock management and conservation treatment are applied and where proper use has been achieved for the production year being reported. Form is designated to contain data for later years if continuing data would be desirable and cooperator is willing to make records available.
2. Production information should be based on records.
3. Under "Tame Pasture" include perennial irrigated as well as dryland pastures.
4. Indicate permitted numbers and length of time on public lands that are separate from home-based operations. Where public lands are fenced and managed within the boundaries of the regular operating unit, acreage should be included in total and also as part of the native range information.
5. Technician's evaluation of proper use should be determined on the basis of Standards and Specifications in the local Work Unit Technical Guides for native range, grazed woodlands, and tame pastures.
6. Livestock information should be inserted where the form does not provide for individual situations. Unusual variations in sales or purchases should also be noted.
7. Annual fixed costs - taxes on land shall include those on the range land- other crop and pasture land taxes are included as a part of the crop costs. The annual costs for capital improvements(fences, water developments etc.) include applicable amortization costs plus annual O & M.
8. Under "Remarks" record climatic or other unusual conditions that affected sales or production during the year being reported. Also include income from wildlife or recreation under "Remarks"

SPREAD SHEET SUMMARY FROM FORM B - ARIZONA TO DATE

Year of Record	Ranch Acres	Stocking A.U. per Section	% Total Ranch in Poor Condition	% Calf Crop	Calf Wts. @ sell- ing or weaning age	Annual Fixed Cost \$ per A. U.										Annual Livestock Costs \$ per A. U.							Total Annual Cost \$ per A.U.	Net Return \$ per A. U.
						Taxes, Land Imp. and Livestock	Improvements Barnes, etc.	Fences New and Old	Water Develop- ment-New & Old	Roads, Trails, etc.	Conservation Treatment	Grazing Leases & Fees	Insurance & Other, Misc.	Supplemental Feed, Salt, Min.	Interest on Inv. Livestock	Labor	Vet. Expense & Medicine	Trans. & Marketing	Machinery & Equipment	Dues, etc. & Other Misc.				
1961	14222	5	57	73	343	4.75	7.38	1.55	5.16	0.38	0	4.79	0	6.46	10.13	15.42	0.77	0.63	5.66	0.95	65	-7		
1961	47481	8	45	90	468	7.99	5.63	0	9.58	0	0	0.31	1.66	12.45	12.14	7.10	0.95	0.35	10.07	0	74	14		
1961	3850	21	8	85	371	4.00	0	2.37	4.93	0	0	4.14	1.99	7.86	12.17	12.98	3.44	0.94	2.56	0	60	11		
1961	47162	16	38	82	366	2.14	0.70	0.47	0.94	0.12	0.07	2.01	0.21	2.85	8.77	4.79	0.75	0.43	1.17	0.29	27	16		
1961	38125	14	15	NA	NA	4.15	0	5.24	4.27	0	0	3.31	0.59	6.66	12.12	13.98	0.71	0.59	4.61	0	57	43		
1962	12720	13	62	70	332	4.15	2.94	0.84	3.37	0.38	0	1.02	0	4.95	8.63	6.20	0.22	0.44	4.06	0.38	39	0.11		
1962	3840	19	1	86	385	0.89	1.47	5.31	0.45	0	0	3.16	1.07	18.56	10.68	17.86	0.45	1.92	2.90	1.12	65	6		
1962	3850	20	8	82	415	3.33	0	2.68	6.54	0	0	4.31	2.55	6.18	12.50	8.94	1.65	1.05	2.64	0	56	18		
1962	47481	8	45	89	478	8.67	5.79	0	12.09	0	0	0.28	1.37	7.98	12.12	12.55	0.62	0.28	11.03	0	79	10		
1962	38125	19	15	83	413	4.53	0	3.85	3.41	0	0	2.61	0.78	2.35	13.36	6.68	0.17	0.22	3.39	0	42	22		
1962	47162	17	38	80	416	2.13	0.69	0.47	1.15	0.11	0.40	1.98	0.20	5.38	8.39	4.73	0.78	0.63	1.16	0.29	30	47		
1962	302055	3	18	91	482	6.45	0.57	1.42	1.92	0	0	4.47	24.40	8.91	5.42	22.73	0.29	0.39	4.91	0	82	33		
1963	12720	12	62	65	315	4.77	3.30	0.94	3.79	0.42	0	1.15	0	5.07	8.73	5.47	0.40	0.42	2.64	0.27	42	0.94		
1963	6799	28	5	70	370	4.23	0.43	2.65	2.53	0.42	0	0.61	0.47	6.70	11.64	15.08	0.45	0.38	7.78	3.83	57	13		
1963	48733	7	1	98	370	3.01	2.37	3.51	6.62	0	0.50	1.15	0.65	6.29	9.09	10.78	1.12	2.37	5.53	1.29	*158	14		
1963	3850	20	8	88	411	3.55	0	2.70	6.77	0	0	4.58	4.45	5.79	12.44	14.67	2.39	1.55	2.88	0	65	19		
1963	47481	8	45	89	489	7.98	5.68	0	11.86	0	0	0.27	2.01	12.26	12.55	11.85	0.73	0.85	11.05	0	83	-0.03		
1964	27109	9	10	48	443	1.02	1.56	0.48	0.58	0.46	0	4.44	0.45	6.35	14.20	7.22	0.18	0.09	2.93	2.32	44	-7		
1964	47481	8	45	93	494	10.11	5.82	0.22	0.52	0	0	0.27	2.86	11.39	12.85	11.44	0.90	0.14	11.31	0	84	-8		
1964	18179	5	7	98	375	7.17	0.43	0.47	3.26	0	1.20	1.54	2.91	21.09	7.96	17.39	0	0	10.00	0	77	-9		
1964	12720	11	62	60	260	5.21	3.33	0.96	3.82	0.43	0	1.25	0	7.27	8.72	5.84	0.49	0.35	3.56	0.32	43	-16		
1965	27109	10	10	84	458	1.00	1.50	0.46	0.55	0.48	0	4.43	0.50	3.86	14.25	2.43	0.51	0.52	2.82	4.77	43	20		
1965	13300	15	4	91	430	2.84	0.56	1.38	4.18	1.19	0	5.30	3.17	3.02	12.11	12.02	0.44	0.78	8.02	0.41	58	22		
1965	14835	13	53	79	424	2.56	2.83	1.08	5.28	0	0.13	1.15	0	3.43	8.86	11.16	0.55	0.26	4.27	0	42	26		
1965	12720	12	62	55	284	5.07	3.29	0.94	3.77	0.42	0	1.22	0	7.71	8.41	8.16	0.59	0.59	3.58	0.40	46	-7.48		

* Cow-calf operation and buys yearling steers.

NOWATA COUNTY SCD RANGE COST AND RETURN EVALUATION WORKSHOP

Estimated costs and returns from an 800 acre Nowata County ranch, using a 100 animal unit cow-calf operation. A loamy prairie range site in good to excellent condition is used in this study. Proper use vs. overuse on the same number of acres. Data supplied by local ranchers.

A. STOCKING RATE

<u>Item</u>	Overuse (133 A.U.) (6 ac./A.U./Yr.)	Proper Use (100 A.U.) (8 ac./A.U./Yr.)
Average weight of calves sold	350#	450#
Average weight of cull cows	800#	950#
Average weight of cull bulls	1200#	1400#
Percent calf crop	85%	90%
Death loss	5%	3%

B. BREEDING HERD

<u>Item</u>	Overuse (Number)	Proper Use (Number)
Cows	105	80
Replacement heifers (2 yr. old)	16	12
Replacement heifers (1 yr. old)	16	12
Replacement calves	16	12
Bulls	<u>5</u>	<u>4</u>
Total	158	120

C. ANIMALS SOLD

<u>Item</u>	Overuse (Number)	Proper Use (Number)
Calves	73	60
Cull cows	10	9
Bulls	<u>1.2</u>	<u>1</u>
Total cattle for sale	84.2	70

D. POUNDS OF BEEF FOR SALE

<u>Item</u>	Overuse (Pounds)	Proper Use (Pounds)
Calves	25,500	27,000
Cows	8,000	8,550
Bulls	<u>1,440</u>	<u>1,400</u>
Total pounds beef for sale	34,990	36,950

EXHIBIT - 14-Continued-1

E. GROSS INCOME FROM CATTLE SOLD

<u>Item</u>	Overuse	Proper Use
Calves (25,500# @ 27¢)	\$6899.00	(27,000# @ 25¢) \$6,750.00
Cows (8000# @ 15¢)	1200.00	(8550# @ 15¢) 1,282.00
Bulls (1440# @ 18¢)	259.00	(1400# @ 18¢) 252.00
Total Gross Income	<u>\$8358.00</u>	<u>\$8,284.00</u>

F. LIVESTOCK COSTS

<u>Item</u>	Overuse	Proper Use
Prairie Hay		
38 da. @ 20#/da/cow = 760#		25 da. @ 20#/da/cow = 500#
760# x 133 A.U. = 50 Tons		500# x 100 A.U. = 25 Ton
50 Tons		25 Tons
50 Tons @ \$15.00 Ton =	\$750.00	25 Tons @ \$15.00 Ton = \$375.00
Protein (CSC)		
150 da. @ 2#/da = 300#		150 da. @ 2#/da = 300#
300# x 133 A.U. = 20 Tons		300# x 100 A.U. = 15 Tons
20 Tons x \$70/Ton =	\$1400.00	15 Tons x \$70/Ton = \$1050.00
Salt and Minerals		
\$2/head/yr x 133 A.U. =	\$266.00	\$2/head/yr x 100 A.U. = \$200
Vet., Medicine and Spray		
133 A.U. x \$4/head =	\$532.00	100 A.U. x \$4/head = \$400
Transportation and Marketing		
Cows \$1 each		
Calves .50 each		
Comm. \$2. each (cow & calves)		
73 head @ \$2.50 = \$182.50		60 head @ \$2.50 = \$150
10 head @ \$3.00 = 30.00		9 head @ \$3.00 = 27
1.2 head @ \$3.00 = 3.60 = \$226.00		1 head @ \$3.00 = 3 = \$190
<u>\$216.10+ feed cost</u>		<u>\$180 + feed</u>

F. LIVESTOCK COSTS - Continued

Inventory of Herd

	Overgrazed		Proper Use	
	Value/head	Total	Value/head	Total
Cows	\$200 x 105	\$21,000	\$200 x 80	\$16,000
2 yr. old replacements	175 x 16	2,800	175 x 12	2,100
1 yr. old replacements	125 x 16	2,000	125 x 12	1,500
Bulls	<u>500 x 5</u>	<u>2,500</u>	<u>500 x 4</u>	<u>2,000</u>
Total Inventory Value		\$28,300		\$21,600
Interest on Investment		.06		.06
		<u>\$1,698.00</u>		<u>\$1,296.00</u>

Tax on Cow Herd

133 A.V. @ \$2/A.V. \$266.00 100 A.V. @ \$2/A.V. \$200.00

Bull Replacement

1.2 Bulls @ \$500 \$600.00 1 Bull @ \$500 \$500.00

Miscellaneous Equipment \$200.00 \$200.00

Total Livestock Costs \$5,938.00 \$4,411.00

G. RANGELAND COSTS

	Cost/Acre	No. Acres		
Taxes	\$.40	800	\$320.00	\$320.00
Fences	.50	800	400.00	400.00

Fence cost includes \$25/mile/yr. maintenance and \$32/yr/mi. establishment cost based on 20 year as life of fence. (\$400/mi. amortized at .08.)

Stockwater \$.75 800 \$600.00 \$600.00

Water cost includes \$80/yr. maintenance on 8 ponds. \$500/pond x 8 ponds = \$4,000. \$4,000 amortized at .1295 = \$518.00 annual cost. \$518.00, plus \$80.00 maintenance ÷ 800 acres = .75 cents per acre, or total, 10 yr. life . . \$1,320.00

H. SUMMARY

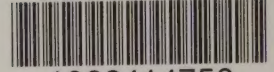
Gross return	\$8,358.00	\$8,284.00
Less Livestock Costs	<u>5,938.00</u>	<u>4,411.00</u>
	\$2,420.00	\$3,873.00
Less Rangeland Costs	<u>1,320.00</u>	<u>1,320.00</u>
Estimated Net Returns	<u>\$1,100.00</u>	<u>\$2,553.00</u>

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